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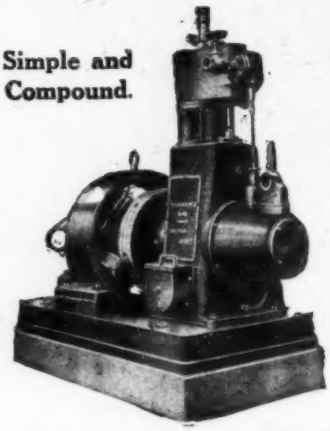

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ELECTRICAL REVIEW.

VOL. LXXXIV. JUNE 27, 1919. No. 2,170.

ELECTRICAL REVIEW.

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RAILWAY ELECTRIFICATION AND SIGNALLING.

MAIN-line electrification will no doubt bring about a considerable modification in British signalling practice, and it would seem that the modification will be towards the adoption of American methods. Formerly British signalling was considered the best in the world; to-day it is outclassed by American. The main difference between British and American signalling is that the former is based on manual operation and human control, the latter on power operation and electrical control.

That British signalling has not progressed to the same extent as American, is partly due to the following reason. On most British railways the function of signalling—one of the most important in railway operation—is actually divided between two separate and distinct departments, to one being assigned what is regarded as mechanical, and to the other what is considered as electrical signalling. Sometimes the heads of these departments may be responsible directly to the general manager, sometimes to the civil engineer, sometimes one to the civil and one to the mechanical engineer. The result is not fortunate. The tendency has grown to regard a Government department as the principal authority on railway signalling, and "not to do electrically what can be done mechanically," is a principle one often hears laid down during discussions on signalling matters. With the advent of electrification, it may be expected that signalling will be regarded as signalling without any qualification, and that the engineer responsible for it will be required to be electrical.

One change in signalling methods which will be inevitable with electrification is in the character of the track circuits. There is already a number of these in operation on main lines, and it is understood that an extended use of them is regarded as part of any electrification scheme, quite apart from the demand for these appliances brought about by labour conditions. These track circuits are at present almost all of the direct-current type. With electrification they will require to be operated by alternating current. This, in turn, will probably mean the use of impedance bonds for carrying the propulsion current across the rail joints at the ends of the track circuits, and for limiting the flow of the alternating current of track-circuit frequency across from rail to rail. The value of the impedance of these bonds to the track-circuit current may be well under 1 ohm. In America, from which country alternating-current track-circuit apparatus and experience usually comes, such low-impedance bonds are probably quite satisfactory, as the impedance may be considerably higher than the rail-to-rail resistance through the axles of the heavy cars used there. In this country, however, the problem is not quite the same, the resistance from rail to rail through the axles of some of the light vehicles used here being under some conditions high enough to have little effect on the

oint resistance of the permanent shunt, due to the ballast leakage and the bond impedance. The matter is one which will require to be carefully examined.

There would not appear to be any difficulty in retaining the present manual block signalling system under electrification. But electrification would certainly offer the opportunity for making extensive installations of automatic signalling. Time was when the manual block system (under which the signalmen working with a code of rules, and assisted with reminders in the shape of electrical indicators, keep the trains properly spaced) sufficed, but it has been necessary so to augment the rules, and add such a number of controls to the reminder indicators, that the manual block system is becoming extremely complicated, and the time is ripe for a change to the simpler and more direct methods of the automatic block.

In large centres, with power available, as it will be with electrification, power interlocking—that is, the electrical control and operation of points and signals—should generally replace the present mechanical plant. It seems little short of an anachronism that in these days men of the intelligence necessary to supervise train movements should be required to exercise such supervision, and at the same time make the continuous physical effort demanded by the manual operation of points and signals.

The electrification of main-line "signalling" seems a necessity, apart altogether from the general question of electrification.

Electric Transmission.

The question which has so long been in dispute—whether it is cheaper to carry coal or to transmit energy in the form of electricity—seems to have given place to a secondary problem, namely, whether the electricity should go overhead or underground. But the former should not be altogether shelved; the weight of opinion at present clearly fixes the ultimate economical limit of electrical transmission under English conditions at 30 or 40 miles, but Scottish conditions—so far as relates to the water-power proposals which have lately been under consideration—may favour 100 miles, and Irish conditions, when a satisfactory method is found of turning the peat bogs to account, may also call for long-distance transmission. We are far from attaining finality in methods of transmission, and some day directive wireless transmission may be developed to a degree as yet undreamt of.

In the meantime, it is right that attention should be directed to the question which constituted the technical subject of the I.M.E.A. Convention—the relative merits of overhead lines and underground cables—for this is a matter that will shortly assume an aspect of the first importance. Mr. Pearce, in his admirable exposition of the subject, held the balance evenly between the rival methods, and left his hearers to draw their own conclusions from the abundant data that he provided; it was interesting to observe, however, that his paper was generally regarded as stating the case for the cable, and for some time it appeared as though no one had a good word to say for aerial lines. We cannot help feeling that this was regrettable, and we were pleased to hear Mr. Wordingham challenge the tendency to regard the overhead system as down and out, while Mr. Burr opportunely quoted his satisfactory experience with it in South Wales.

The fact appears to be that British practice, since the early days, has always favoured the cable; it is one of the many consequences of the parochial system of supply that was forced upon the country by Parliament some 30 years ago, confining generation and distribution mainly within narrow boundaries in populous areas, where obviously the cable was the right thing to use. Few of the members of the Association have had extended experience—we might almost say any experience—with overhead lines, and the case for the latter was never adequately stated.

Frankly, we regard the discussion as one-sided and unintentionally misleading. There is a great deal to be said for overhead transmission; it was not said. In the case of distribution in sparsely populated areas, the arguments are almost entirely in favour of aerial lines, but we admit that this case did not fall within the scope of the discussion.

Mr. Pearce's confidence in the 66,000-volt cable came as a surprise even to Mr. Fedden, and still more to those who had not recently studied the subject. We would point out that this cable is not yet on the market, whereas overhead transmission at 66,000, and up to 150,000, volts is well established practice; comparisons, therefore, should be made rather between 66,000 volts and upwards with overhead mains, and 33,000 volts as a present maximum underground. If this is done, Mr. Pearce's data show a marked advantage on the side of overhead transmission so far as costs are concerned.

Whitley Councils.

The relations of the Whitley Report to the electricity supply industry formed a prominent feature of the proceedings at the Annual Convention of the I.M.E.A. last week, and the members were fortunate in having the constitution and functions of the Joint Industrial Council expounded to them by no less an authority than the chairman of that Council. Alderman Walker certainly scored a triumph on that occasion; his paper was rightly regarded as a classic on this important subject, and his explanations and suggestions were admirably conceived and ably placed before the meeting. Moreover, not only has he made a close study of the matter, but also he has acquired experience of the actual working of the principles embodied in the Report. Works Committees having been formed in the Manchester Corporation Electricity Department a year ago. We are glad to learn that after six months' trial of the scheme, the employés expressed satisfaction with the results obtained, and decided to carry it on throughout the current year. The scheme evolved at Manchester is so complete and well thought out that we have judged it advisable to reproduce the details *in extenso*, for the benefit of other undertakings; modifications can easily be introduced to suit local conditions.

The sense of the meeting was strongly in favour of the Whitley system, and we were particularly interested in the views expressed by several working-man Councillors, whose contributions to the discussion were both illuminating and instructive.

The Joint Industrial Council as yet is in the throes of organisation; the District Councils cannot come into existence until the districts are outlined; but the Workshop Committees can, and should, be formed without delay and got into working order. As we have frequently pointed out, small differences and difficulties, if tackled at once with mutual goodwill, can often be smoothed away by a friendly discussion, whereas, if they are allowed to fester unchecked, they may grow into serious grievances and eventually involve a large area in turmoil. Apart from this, the Committees and Councils are not intended merely to settle disputes, but to anticipate their development and to institute reforms and improvements in working conditions in all kinds of ways. "*Human sympathy*" should be the key-note of their conduct, and harmonious co-operation for the common good their aim. The worker has demonstrated his right to be regarded as a man and a brother, a right which in the past has too often, but not always, been ignored; we are glad that, having won the greatest war in history, he is in a fair way to share in the blessings of peace.

ELECTRICITY SUPPLY AT SHANGHAI.

In view of the development of electricity supply undertakings in this country during the war period, a review of the recent activities of the Shanghai Municipal Council's electricity department, for which we are indebted to Mr. T. H. U. Aldridge, M.I.E.E., &c., engineer-in-chief and manager, may be of interest.

Early in 1916, contracts were placed for 25,000 KW. of turbo-generator plant with the following firms:—One 10,000-KW. turbo-generator and condensing plant to the General Electric Co., of New York; one 10,0000-KW. turbo-generator and condensing plant to Messrs. Parsons and Co., of Newcastle-on-Tyne; and one 5,000-KW. set to Messrs. Fraser & Chalmers—Vickers. The G.E.C. machine was delivered in 1917, and was put into commission in August of that year. The Fraser & Chalmers machine only arrived in the latter part of 1918, and was put into commission in January of this year. The Parsons machine has not yet been shipped from England. When this particular machine was practically completed in 1917 the Government commandeered it, as it was required for the Sheffield Corporation electricity works. Messrs. Parsons were given a licence to build another machine for Shanghai, but it is interesting to note that, with the exception of the rotor of the generator, the first machine has never been delivered to Sheffield. It is hoped that the second machine may be shipped from Newcastle this year.

ground, were supplied by the British Insulated and Helsby Cables, Ltd. These cables were all laid and completed during 1917.

Two motor-driven circulating water pumps of 20,000 gals. per minute capacity each, by Messrs. Mather & Platt, were provided.

In spite of the war, the demands for electricity have increased very satisfactorily during the past few years, and in 1917 it became necessary to consider further extensions. It was decided to call for tenders for a 15,000 or 20,000-KW. turbo-generator, and also additional 22,000-volt split-conductor cables, pumping plant, and 22,000-volt switchgear. For the purpose of obtaining this material, Mr. Aldridge went to the United States in the autumn of 1917, and issued specifications in New York for the material required. At the same time tenders were called for in England for a 15,000-KW. turbo-generator, and tenders were received from the General Electric Co., of New York, and the Westinghouse Electric Export Co., of Pittsburg. The British tenders were for a 15,000-KW. set, and the American tenders for an 18,000-KW. set, this being their nearest standard size adapted for 50-cycle operation, the usual frequencies in the States being 60 and 25 cycles. The British tenders were lower than the American, but, unfortunately, the Ministry of Munitions was not able to give any guarantee that a licence would be issued to build

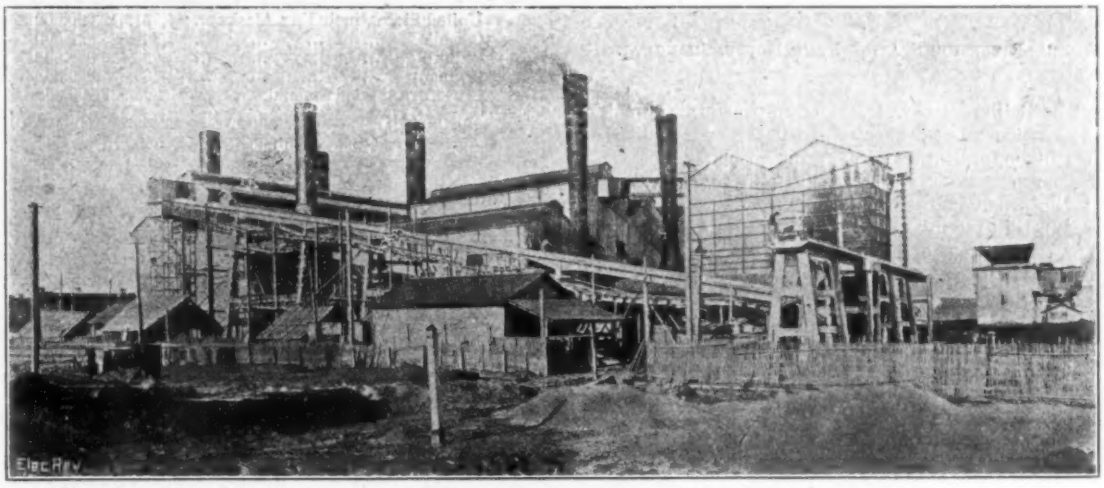

FIG. 1.—RIVERSIDE POWER STATION, SHANGHAI.

At the same time that these turbines were ordered, a contract was placed with Messrs. Babcock & Wilcox for eight marine-type water-tube boilers, each having an evaporative capacity of 40,000 to 50,000 lb. of water per hour. Six of these are fitted with B. & W. chain-grate stokers, and two of them with the Taylor stoker made by the American Engineering Co. of Philadelphia. The last two stokers have only just recently been delivered, and are now being erected, consequently there has been no opportunity of testing them against the chain-grate stoker with the coals which are locally obtained from Japan and China. The boiler plant was all delivered in 1917, with the exception of some of the pipework which was lost at sea.

The steelwork for the turbine room and boiler house, bunkers, &c., was supplied by the United States Steel Products Corporation, the tender being £2,000 lower than any of the British tenders.

The 22,000-volt switchgear for the main Riverside Power Station, and for the Fearon Road sub-station (this is the original generating station, which is being gradually converted from a generating station to a main sub-station and distributing centre), and also 6,600-volt switchgear for the Fearon Road station, was all placed with the British Thomson-Houston Co., Ltd., of Rugby. Four trunk cables, each five miles in length, consisting of 22,000-volt, split-conductor, lead-covered and armoured cable laid direct in the

the machine, nor could any undertaking be given as regarded delivery. As it was becoming increasingly urgent to obtain additional plant for Shanghai, it was necessary to place the order in America, and the tender of the General Electric Co. for an 18,000-KW. machine with its most efficient load at 16,000 KW., and with a capacity of continuous operation at 20,000 KW., with a somewhat higher steam consumption, was accepted. The guaranteed steam consumption of this machine with a 29-in. vacuum is as follows:—10·95 lb., 13,500 KW.; 10·95 lb., 16,000 KW.; 11·1 lb., 18,000 KW.; 11·35 lb., 20,000 KW.

A contract was also placed with the Worthington Pump and Machinery Corporation for an electrically-driven vertical centrifugal pump to provide the circulating water for the big turbine. This motor is constructed for operating at the power house generating pressure of 6,600 volts.

For the equipment of a large sub-station designed for handling a 25,000-KW. load in a growing industrial district the General Electric Co. received the contract for 22,000-volt switchgear. A 6,500-K.V.A. synchronous condenser was also ordered from the same firm, the function of this machine being to raise the power factor at this large sub-station, which is situated about 10 miles from the Riverside power station. The load in the district served from this sub-station is almost entirely industrial, the bulk of the supply being given to cotton-spinning and weaving mills,

flour mills, and oil mills; in addition, power is supplied for various other purposes, amongst which is a jute mill, and also an incandescent electric lamp factory owned and operated by the General Electric Co., of New York. It is to be noted that the last two enterprises inaugurate new industries upon a commercial scale in Shanghai. To connect the Fearon Road sub-station with the 25,000-KW. sub-station just referred to, two trunk cables, each approximately five miles in length, consisting of 22,000-volt, split-conductor, lead-covered and armoured cable, were also ordered from the General Electric Co., British manufacturers not being in a position to supply this cable owing to Government restrictions.

For the Fearon Road station, from which at the present time the Shanghai Tramway Co. is supplied with direct

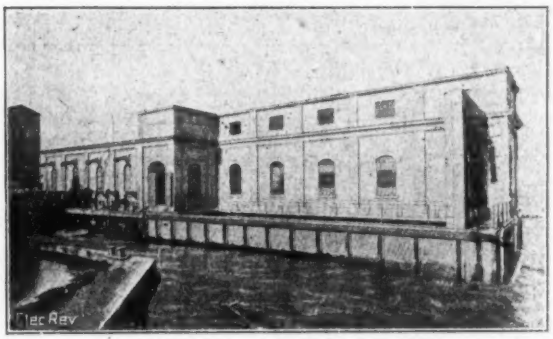

FIG. 2.—RIVERSIDE STATION PUMP HOUSE, SHANGHAI.

current by Belliss-Peebles steam-driven generators, a motor-generator-synchronous-condenser set has been supplied by the Westinghouse Electric Co. This machine is designed to give an output of 600 KW. D.C. for traction purposes, whilst the synchronous condenser is rated at 3,250 K.V.A., its purpose being to improve the power factor on the system between the main power station at Riverside and Fearon Road.

When Mr. Aldridge returned from the States he found that, owing to the uncertainty of getting the Parsons machine and, moreover, to the absolute unreliability of the A.E.G. turbo-alternators (two 2,000-KW. and two 5,000-KW.), 9,000 KW. of which has been out of commission since last autumn owing to very serious breakdowns in the generator end, it was necessary that in order to safeguard the undertaking by the provision of a sufficiency of plant a second 18,000-KW. machine should be ordered. The reasons given for placing an exact duplicate machine with the General Electric Co. are referred to later; although both the Electricity Committee and the engineer-in-chief would naturally have preferred a British machine, the uncertainties were such that it was decided that the best interests of the undertaking would be served by having a duplicate G.E.C. set. A strong factor influencing the recommendation of this second machine was that the General Electric Co. was in a position to give quick delivery, and, furthermore, as the machine would be a duplicate of the first one, the original drawings were applicable; consequently, all the foundation work is being carried out from these drawings, and a considerable saving of time thereby effected. If tenders had been called for in England it would have been several months before drawings could have been obtained, and valuable time would have been lost.

These explanations are put forward because it may appear strange that a British engineer responsible for an undertaking of this size should favour American machinery, but it should be borne in mind that it was practically impossible to get this plant with any degree of certainty in England, whereas the Americans have been able to fulfil their contracts within very reasonable time. Moreover, the conditions at Shanghai were such that in order to meet the growing demands for electricity it was very necessary to obtain plant with the utmost dispatch. Owing to the serious breakdowns of the German machinery on various occasions the undertaking was very seriously handicapped in the winter of 1917, and not only was it run without any spare plant, but for several weeks it had to curtail the supply to industrial users between the hours of 4 p.m. and 10 p.m. daily. The scale of further extensions outlined below may appear at first sight somewhat extravagant, but in this connection it should be pointed out that 14,000 KW. of A.E.G. plant is to be scrapped, and also the Fearon Road station containing about 5,000 KW. of steam plant is scheduled to be closed down in favour of the more efficient turbine plant at the Riverside Power Station; thus it will be seen that whilst two large units are being installed, at the same time about 19,000 KW. of less efficient plant is being removed.

Turning to the financial results of the year 1918, the return on capital outlay was 7·03 per cent., as against 9·42 per cent. in 1917. This was partly due to the heavy capital expenditure on new plant which at the time was non-productive, but principally to the enormous increase in the price of coal, which rose from 1917 to 1918 by about 80 per cent., and the price paid for coal during 1918 was about 170 per cent. above that paid in 1916; in spite of this, however, the price of energy for light and power was only raised about 40 per cent.

The future of Shanghai depends on industrial development, which, in turn, is dependent on electric power supply. China cannot expect much development of water power for the production of electric power; she is dependent upon coal for her industries, and is content to import it, although, as the following figures show, she is one of the three countries most richly endowed with coal resources:—

	Short tons.
United States, including Alaska ...	4,231,352,000,000
Canada	1,360,535,000,000
China	1,097,436,000,000
Germany	466,665,000,000
Great Britain and Ireland, &c. ...	208,922,000,000

When one pauses to consider the coal wealth of China, the cheap labour, the wonderful facilities afforded by the waterways, and to a lesser, but improving, degree by railways for transportation, a feeling, not so much of pity

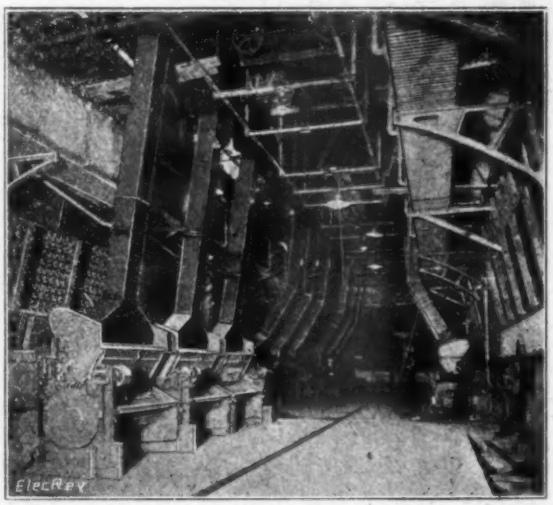

FIG. 3.—NO. 2 BOILER HOUSE, CONTAINING EIGHT B. & W. 50,000-LB. BOILERS.

as disgust, comes over one at the thought of all this valuable coal lying buried for want of initiative to work it. The coal question is of vital importance to the electricity department, as it is also to those industries dependent on it for cheap electric power. The price paid by the department has risen since 1914 from Tls. 5·70 per ton to Tls. 16·30 last year.

China has a very long way to go before she can begin to approach the commercial and industrial activities of European countries, but she possesses two of the principal minerals—coal and iron—with which to build up her State. Whether foreign capital would be necessary for development upon a scale commensurate with the position which her

buried wealth should enable her to attain, is outside the province of this report, but that she will need foreign assistance—nay, supervision—in such development is patent to all; such assistance, however, need not and should not mean foreign domination, but rather mutual co-operation in the fullest sense of the words. If, as indications certainly suggest, Shanghai is to become increasingly important as a manufacturing centre, it must have cheap electric power, and it cannot have that without cheap coal. Last year a suggestion was made in the local Press that the Municipal Council should purchase mining rights and operate the coal mine acquired as a municipal co-operative business to meet the requirements of Shanghai. It may be doubted whether this form of municipal socialism is the best solution of the coal problem. The suggestion is offered that a local company formed by both foreign and Chinese residents, both having representation on the board, would be best fitted to undertake the supply of coal to Shanghai. The scheme, to be a success, should be organised on a co-operative basis, and it is suggested that part of the capital should be found by large users of coal who would have a direct interest in the efficient operation of the mine to the extent of securing a sufficient supply of cheap coal for Shanghai. The question requires a good deal of serious consideration, but once the initial difficulties were overcome the prospects of successful enterprise might be regarded as assured. It is rumoured that within five or six years Japan will not be able to export much of her own coal. Perhaps, also, the chance that China will open up her coal fields on scientific and commercial lines within a reasonable time is too optimistic. The more pressing does it therefore become for Shanghai to take the matter in hand itself. The proposal outlined is offered in all seriousness by the engineer-in-chief in his annual report, because he believes that unless steps are soon taken to ensure a continuous supply of cheap coal, Shanghai may be compelled to pay exorbitant prices for this all-important commodity, which will seriously react upon its commercial future in the Far East.

Since the Armistice there have been signs of renewed activities, which clearly show that an era of industrial expansion may be confidently looked for in the next year or two. The textile trade is, so far, the largest user of electric power, after which comes flour milling. It is significant that practically all the new mills and factories which have been established during the past five years operate by electric power purchased from the electricity department rather than from individual steam-power plant of their own. In the older mills, which are driven by steam power, the conversion from steam to electricity is gradually, but surely, taking place.

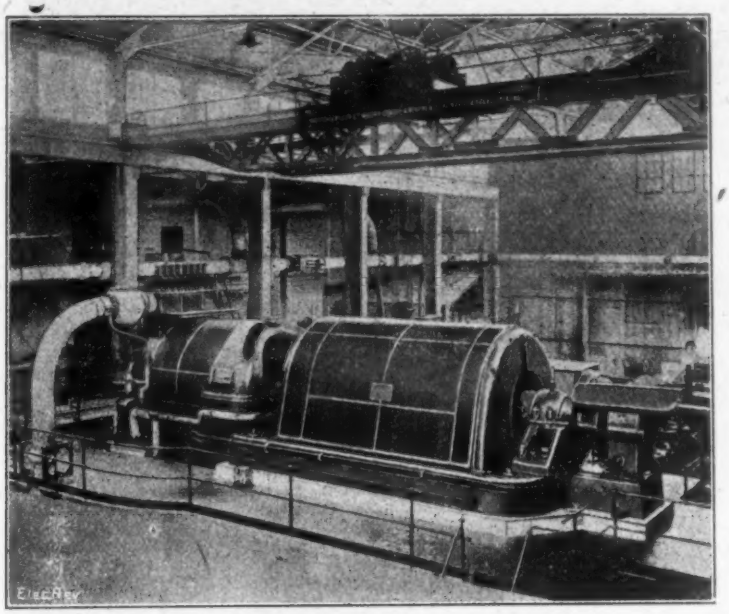

Fig. 4.—10,000-kw. G.E.C. (N.Y.) Turbo-Generator.

In former reports the various uses to which electric power is put in Shanghai have been written about. Suggestions are now offered to indicate further uses to which it may be applied in Shanghai on lines following its application in Europe and America since the outbreak of war called for the greatest production efforts.

Shanghai, with cheap electric power, may yet develop into a steel-producing centre. The city is better equipped and organised for manufacturing processes than any other city in China. Generally speaking, it is true that the prosperity of a city depends not only upon the magnitude of any one particular industry, but upon the diversity of industries, and on the recognition of this axiom and its practical application the future of Shanghai, as the first city of China, to no small extent depends.

With regard to building and structural work designed to this department's requirements by the Public Works Department, and executed under its supervision, it is commonly believed that the electricity undertaking being municipally owned, services of the nature referred to are rendered free by the Public Works Department; but this is a misconception. Upon all constructional work, whether undertaken by Public Works Department labour or by contract, a fee of 7 per cent. is paid on the cost of the work to the Public Works Department by the electricity department. This explanation is made because there still persists an idea that the electricity undertaking, being a municipal concern, enjoys certain advantages, which it would not possess if it were a public company.

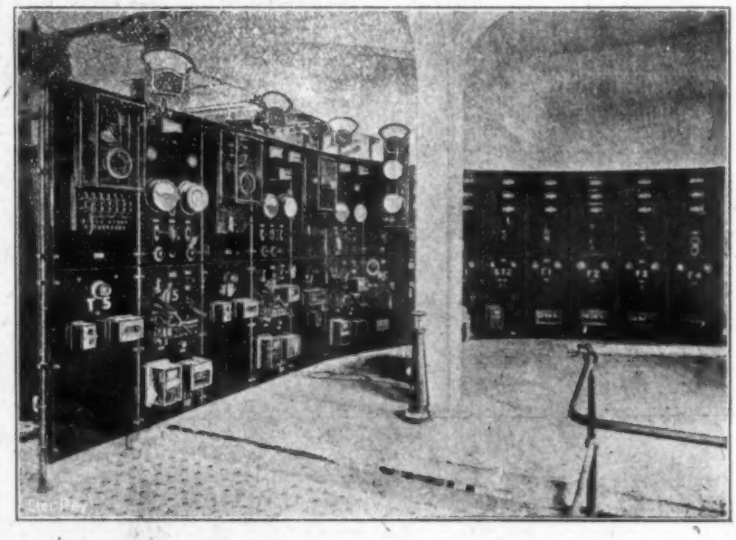

Fig. 5.—B.T.H. Remote-Control Generator Switch and Instrument Panels and 22,000-volt Trunk Feeders.

Further extensions to the Riverside power station have been sanctioned, and will be referred to in our next issue.

THE ELECTRICITY SUPPLY BILL.

(*Continued from page* 720.)

Bradford's views, as voiced by Mr. T. Roles, city electrical engineer, are similar to those of other municipalities: the Bill is welcomed as making for the good of the nation, but the terms of purchase are not acceptable, and as the Ministry of Ways and Communications will only use 20 per cent. of the output, it should not be entrusted with the powers of the Bill. An important point is raised by Mr. Roles—namely, that if the mains are extended to unprofitable areas, such extensions should be made at the cost of the nation, and not charged on existing industries.

At Birmingham, the chairman of the Electricity Supply Committee, in submitting the annual report of the undertaking, said that the Committee generally approved of the Bill, but objected to the "standard price." He made the assumption that Birmingham would become the centre of a District with a radius of 20 miles, and we notice that at other industrial centres the same idea has found expression; but here, we think, a grave error is made. The Districts will have to be far larger than that.

In the discussion in the House of Commons on the second reading of the Bill, Sir A. Williamson, chairman of the Board of Trade Committee, on whose report the Bill was drafted, pointed out that it was essential that the Boards should be small and the Districts large, and suggested that the whole of Lancashire, for instance, should be one District. To confine the Districts to 20-mile radii round big centres would be a fatal mistake.

At Stoke-on-Trent the Electricity Supply Committee recommended the Council to urge the Government to make the area within a 10-mile radius of Stoke Town Hall the District for North Staffordshire!

The feeling of the Provincial Companies was expressed by Mr. H. B. Renwick at the annual meeting of the General Committee; he took the same line as Mr. Braithwaite and Mr. Tuckett with regard to the breach of faith in changing the terms of purchase, and pointed out that if the companies were supplied with energy in bulk, and at the same time their prices were controlled by the Electricity Commissioners, they would be "tied at both ends." It is clear from his speech that the purchase terms, and certain other details, will be strenuously opposed by the companies. At the same meeting Mr. George Balfour, M.P., dealt with the subject on the basis of the public welfare; he held that the appointment of Commissioners was a sound policy, but that the District Board part of the scheme was contrary to the public interest, and should be opposed by the whole industry.

The Provincial Electric Supply Committee of the United Kingdom, representing 122 companies, has issued a memorandum to Members of the House of Commons, in which the Bill in its present form is declared to be not in the public interest; the proposed machinery of the District Boards is considered cumbersome, ineffective and expensive, and it is urged that the appointment of Electricity Commissioners alone would suffice to ensure a cheap and abundant supply of electricity. The proposed terms of compulsory purchase are described as inequitable and as constituting a breach of the Parliamentary bargain upon which the industry has been built up—a contention already advanced by metropolitan company representatives.

In Dublin the city electrical engineer, Mr. L. J. Kettle, has taken up an attitude of determined opposition to the inclusion of Ireland in the scheme. He points out, in a letter to the Corporation, that the investigation on which the Bill was based was confined to Great Britain, and that the conditions in Ireland, where there are no compact industrial areas, blast furnaces, or coke ovens, and very few power stations, are totally different. No advantage could be gained by dividing the country into areas under District Boards and controlling the supply industry from London, and if in the future a reorganisation of the industry is necessary, it will be far better done by an Irish authority. The Corporation decided to circulate the letter and hold a special meeting to consider the question.

BRADFORD.

The Bradford Corporation Electricity Committee welcomes the reform proposed by the Electricity Supply Bill. At the same time certain amendments are suggested by the committee. A special advisory sub-committee went very carefully through the Bill, and Mr. Roles received a representative of the *Yorkshire Observer*, and indicated to him the attitude of the committee.

"We regard the Bill generally with favour," he said, "as it is quite realised by the Electricity Committee that there should be greater co-operation between the supply authorities. The committee is doubtful whether any district board under the new Bill will be able, for some time to come at any rate, to give a cheaper supply in Bradford than has been provided by the Bradford Corporation." The Electricity Commissioners are given very wide powers, and this should be all to the good provided that, as it is hoped, the right men are appointed to the positions. The Electricity Commissioners should be experts on the subject of electricity supply, and therefore we look to them to frame such regulations as will interfere with the industry as little as possible. "We think there should be a clause making it clear that if it is necessary to extend the mains at a large capital expenditure to thinly populated areas for agricultural and other purposes these extensions should be made at the national expense, and not be a charge on existing industries."

MR. H. B. RENWICK'S VIEWS.

Presiding at the second annual general meeting of the Committee of the Provincial Electric Supply Committee of the United Kingdom, on May 27th, Mr. Renwick said:—

The Bill affects the fortunes of the companies vitally. In the first place it violates the Parliamentary bargain entered into under the Electric Lighting Act, 1888, and the Bill, as drafted, contains clauses which constitute a distinct breach of faith, particularly in respect of the terms of purchase and the period of the tenure or concession.

The terms of purchase of the generating stations are not the same as those in the Act of 1888, on the strength of which so much money has been raised. It was on the strength of that Parliamentary bargain that the public invested its savings, and it was on the strength of that bargain, too, that we pioneers persevered in the face of the greatest difficulties and tremendous obstacles in developing the industry to its present state of efficiency. In any case, the terms of purchase should be not less favourable than those of 1888, and if we are to accept the conditions set out in the Bill they should certainly be a good deal better than the 1888 terms.

Again, when our stations are taken over we have to take bulk supply from the body set up under the Bill. The question is what price are we to pay for that bulk supply? The wording of the clause dealing with the matter is not satisfactory in its present form and must be amended. Further, the Electricity Commissioners take power to regulate the rates we are to charge our consumers. We are thus tied at both ends. We must have a proper margin in order to carry on our business successfully, and this is essential, not only in the interests of our shareholders, but also in the interests of the public.

Then, again, there is the question of the ultimate purchase of the remaining part of our undertakings, over which it is proposed that we should give a standing option of purchase, and meanwhile we are to submit—most unfairly, I suggest—to competition in our areas from the District Boards. It is true that the competition in question is subject to certain limits and conditions, but in any case the principle is a vicious one.

On all these points and on others we shall press for amendments. We are not averse to progressive change. On the contrary we welcome it, but it must be on equitable lines, and proper regard must be had to the fact that we have been the pioneers in an industry which to-day is admitted to be a key industry. We shall demand full, fair, and equitable compensation for any sacrifices we are called upon to make under this Bill, which we are assured is not intended to impose any hardship upon the existing undertakers.

Whatever ground there may be for nationalisation of railways, there is no ground whatever for nationalisation of electric supply, but while we object to nationalisation of our industry, we raise no objection to official control, so long as that control is on proper lines for the purposes of regulating, co-ordinating, and reorganising the electric supply industry.

We are closely in touch with the other associations in the industry so as to work together in all matters we have in common, for we realise that in this matter a united front is essential to success.

MR. GEORGE BALFOUR'S VIEWS.

At the same meeting, Mr. George Balfour, M.P., said:—

I would press on you all to keep in view, first of all, sound public policy. If you do that you will not go far wrong so far as the protection of the industry is concerned. Therefore, I would ask you to first come to a definite conclusion on the

question: "Is the Bill right or wrong for the public at large?" and having come to a conclusion, start your attack from that point of view. Personally, I am convinced that the Bill is directly in opposition to the public interests, and the two main provisions of the Bill must be looked at from totally different standpoints. So far as Electricity Commissioners are concerned it is, broadly speaking, quite sound, and in the interests of the people, provided the Bill is suitably amended. So far as the District Boards, that is the distributing part, are concerned, I think we are all agreed that it is inequitable. I think the line we should adopt, if you agree with that view, should be to state in plain language first of all that the Bill is wrong, and then if you have any observations as to how it should be amended, make that the secondary item, but make quite clear, if your view is in harmony with mine, that you are absolutely opposed to District Boards as set out in the Bill. I suggest that you should press the view that I pressed in the House of Commons, that the Electricity Commissioners can very readily bring in the District Boards once they, the Commissioners themselves, are organised and the machinery set up by them is working smoothly. It cannot be done quickly, and the Commissioners will have ample work to occupy their attention for twelve months.

THE PROVINCIAL ELECTRIC SUPPLY COMMITTEE.

The avowed object of the Bill is to ensure a cheap and abundant supply of electricity. In the opinion of the Provincial Electric Supply Committee this object will not be attained by the Bill in its present form.

The machinery of control is far too cumbersome to operate efficiently. Delay and confusion are certain to result, when every electrical development over a wide area has to be considered and approved by a heterogeneous body of unwieldy dimensions. Members of District Electricity Boards are to be paid for their services; and the Boards are to be empowered to employ secretaries, engineers and other officials. The cost of these additional services, which are supplementary to the functions of the Electricity Commissioners and of the staff of existing individual undertakings, must eventually be borne by the consumer of electricity, thus leading to increased rates for supply. For these reasons alone the Provincial Electric Supply Committee holds that the District Electricity Boards will not tend towards a cheap and abundant supply of electricity. Further, the District Boards must inevitably lead to excessive organisation and in the opinion of the Provincial Electric Supply Committee are unworkable for the purpose of carrying on a commercial undertaking.

The appointment of Electricity Commissioners is considered by the Provincial Electric Supply Committee to be, by itself, sufficient to guarantee the purposes of the Bill, provided (1) that the Commissioners are chosen for their long and wide commercial experience and business standing, and/or for their knowledge of the electric supply industry, and (2) that they are granted power to remove the present obstacles to the extension and cheapening of the supply of electricity and to authorise the co-ordination and reorganisation of supply whenever necessary. The Commissioners should give full time and hold permanent appointments.

The Bill should not go beyond the appointment of expert Electricity Commissioners who would be free, under the Board of Trade or the Ministry of Ways and Communications to deal equitably with electricity supply in the various districts as they consider best in the public interest.

For the co-ordination and unification of electric supply it may be necessary for the Commissioners to arrange for the compulsory purchase of generating stations owned by authorised undertakers. Under the Electric Lighting Act, 1888, a definite tenure was guaranteed in respect of the whole of the undertaking, and at the expiration of the concession the undertaking as a whole was purchasable at the "then value." If a portion only was purchased allowance for severance was provided for.

The "standard price" or terms of compulsory purchase of generating stations proposed under the Bill are the costs of construction less depreciation. No provision is made for severance under the Bill, although a portion only of the undertaking may be purchased, nor is any allowance provided for loss suffered through the premature purchase of a partially developed undertaking, where the capital expended has not had sufficient time to become remunerative.

The Provincial Electric Supply Committee regards the terms of purchase as set forth in the Bill as a violation of the Parliamentary bargain upon the strength of which so many millions of capital have been invested by the public in electricity supply undertakings. The new terms of compulsory purchase under the Bill should be, at least, not less favourable than those laid down in the Act of 1888, *plus* reasonable compensation for anticipating the date of purchase.

IRISH CONDITIONS.

Mr. P. J. KETTLE, city electrical engineer, Dublin, holds that the Bill should not be applied to Ireland, as it is not at all applicable or desirable. The conditions are essentially different in Great Britain and in Ireland.

"The main reasons I would advance," said Mr. Kettle to a *Freeman* representative, "for the non-applicability of the Bill to Ireland are: (1) The working conditions are essentially different. Ireland has no densely populated industrial areas supplied with electricity in scraps from a heterogenous collection of works, she has no blast furnaces, no coke ovens, and consequently no waste gases. What will suit Great Britain will not necessarily suit Ireland. The whole scheme will naturally be run in the interests of Great Britain. (2) Running and administering Irish electricity supply from London cannot benefit Irish interests. Her interests will be inevitably overlooked and neglected. This work should be done in Ireland by Irishmen, who not only know the conditions and know what they are doing, but who have a direct interest in developing Irish industries. English interests lie in the opposite direction. (3) The report upon which the Bill was based refers to Great Britain only, not to Ireland. Ireland is dragged in as an afterthought. (4) Centralisation cannot be carried out to any profitable extent—there is practically nothing to centralise. (5) The effect of the Bill will be not to reduce but to increase the cost of electricity.

"Standardisation, the development of Irish water power, the exploitation of the Irish peat bogs, the provision in time of a national supply of cheap power, the consequent encouragement and development of Irish industries, are all desirable and very desirable objectives, but they are not going to be achieved by a board in London. They can be and will be achieved only by an Irish authority to whom Irish interests will be paramount."

The electricity nationalisation scheme has created a great deal of interest in Irish industrial circles, especially in and around Dublin, but fears are expressed that it may not materialise in relation to reconstruction in that country. Mr. John O'Neill, chairman of the All-Ireland Munitions Committee, told an interviewer that he shared these fears, which were based on the Government's general attitude towards questions of Irish development. If the proposals were carried out, however, and electrical generating plant centralised in each big district—as in Dublin and its suburbs—it should enable electricity to be supplied very much cheaper than at present, and it would also effect most valuable and important economies.

A prominent Dublin electrical engineer said at present the percentage of electrical power used per manual worker in Ireland was less than that in any other country—except, perhaps, some of the out-of-the-way colonies. It was absurd that in Dublin there should be seven generating stations, and more absurd still that the Dublin Tramways Co., which was in a position to provide cheaper power than any of the other stations, should be prevented by legislation from doing so.

Mr. G. F. Pilditch, electrical engineer to the Rathmines Urban District Council, said that if the idea was to merely take over the control of the small stations it would not help matters much, but he understood the idea was to allow existing small stations to carry on as distributing stations, and that would be a great saving, and it would also mean that no new small generating plants would be allowed.

Mr. S. L. Price, resident engineer, Pembroke (Co. Dublin) Urban District Council, observed that the Irish electrical engineering representatives on the Committee dealing with the matter were opposed to putting the whole of the scheme under the control of the Minister of Ways and Communications, and advocated that it should be worked under the Board of Trade.

In the opinion of Mr. F. J. Allan, secretary, Dublin Corporation Electricity Committee, Government control never worked satisfactorily, and he objected to the Corporation being robbed of the fruits of its enterprise through the lean years, and of the prospects of substantial profits. In Dublin, he said, there were over 700 small power consumers—all of them working some little industry. These enterprises had to be nursed to a certain extent, and it was only municipalities with a patriotic motive towards industrial work that could do that.

Mr. L. Sherlock, chairman of the Dublin Electricity Committee, said there was, and should be, strong objection to having Irish generating stations controlled by an English Board, but if popular prejudice on that matter could be overcome it would undoubtedly be for the general benefit to have for Dublin and the district around it one large generating station, which would produce electricity not only for industrial and domestic use, but also for tramways. If they could secure a central Board for Dublin, which would be free from English interference, and which at the same time would not involve either ratepayer or private company, who had already spent large sums on their own stations, in any loss, then a general central station for all purposes would be an immense advantage.

(To be continued.)

Scientific Research in South Africa.—The Research Grant Board which has been established by the Union Government in South Africa for the encouragement of scientific research, has recently announced its scheme for awarding research scholarships and making grants towards the expenses of scientific research. The scholarships will vary in value from £80 to £250 per annum for one or two years, and may be awarded for a further period. The regulations of the Board may be consulted at the Inquiry Room of the Department of Overseas Trade.—*Board of Trade Journal.*

IN MEMORIAM.

Engineers' Memorial Service at the Abbey.

AT Westminster Abbey, on the 18th inst., a Solemn Service was held in memory of the Engineers who gave their lives for their country, 1914-19. The Abbey was well filled, many people standing. Before the service the band of the Royal Engineers, under the direction of Bandmaster Neville Flux, F.R.A.M., played a selection of music appropriate to the occasion, including Chopin's "Marche Funèbre," the overture to Sullivan's "In Memoriam," Tschaikowsky's "Chanson Triste No. 2," &c.

The service commenced with the singing by the congregation of the hymn, "O God our Help in Ages Past."

After the Lord's Prayer and an anthem the following was delivered by the Dean :—

Let us now praise God for our brethren belonging to the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, the Institution of Electrical Engineers, and the Iron and Steel Institute who have laid down their lives for their King and Country in the great war.

They were men who were drawn from posts of great responsibility and high scientific distinction. They surrendered to the service of their country the gifts of their industrial skill and the riches of their professional experience. In every field of warfare, by sea and land and air, they have won an honourable and immemorial record of great achievement. They were the pride of their homes. They went out in the beauty of their strength and manhood. Their sacrifice has been the price of our country's complete and final triumph. In sure and certain hope of our joyful reunion with them in the day of Resurrection, we now commit the keeping of their souls unto Him who is eternal love and eternal life! May He, through the Holy Ghost the Comforter, strengthen each one of us in the desire faithfully to follow in their steps, that with the same unselfish courage we may strive to do our duty as loyal citizens of our land and as true servants of the Lord Jesus Christ!

The "Doxology" having been sung by all, standing, several prayers were offered by the Dean, the congregation devoutly kneeling, followed by Kipling's "Recessional," the Blessing, the Last Post, the Réveillé, and the National Anthem.

The service, which throughout was simple, impressive, and reverential, was brought to a close with the Grand March "Imperial" (Neville Flux).

The Roll of Honour was composed of several sections setting forth the names of those connected with the different Institutions and Societies representing the engineering profession, who had given their lives for the Great Cause. The following is the list of the losses sustained by the Institution of Electrical Engineers :—

Andrews, G. L. ...	Capt., R.G.A. (*killed in action*)	M.I.E.E.
Carter, W. L.	Capt., R.E. (*died*)	M.I.E.E.
Casson, W.	Capt., London Regiment (*killed in action*)	M.I.E.E.
Davis, V. O. I. ...	Lieut., R.E. (*died*)	M.I.E.E.
Damaresq, A. H. ...	Bt.-Lieut.-Col., R.E. (*died*) ...	M.I.E.E.
Hammond, R. W. ...	Lieut.-Col., Royal Fusiliers (*died of wounds*)	M.I.E.E.
Hopkinson, B., C.M.G., F.R.S.	Colonel, R.A.F. (*accidentally killed*)	M.I.E.E.
Sclater, G. L.	Captain, R.N. (*accidentally killed*)	M.I.E.E.
Seligmann-Lui, G. P.	Director, French Military Telegraphs (*died*)	M.I.E.E.
Thorne, G. S.	Capt., R.A.F. (*died of wounds*)	M.I.E.E.
Tidd, E. G.	Capt., H.L.I. (*killed in action*)	M.I.E.E.

Alderson, A. R. ...	Lieut., R.E. (*killed in action*)	A.M.I.E.E.
Algar, H.	2nd Lieut., R.E. (*died*) ...	A.M.I.E.E.
Andrews, H. G. ...	Lieut.-Com., R.N.V.R. (*died*)	A.M.I.E.E.
Baldwin, H. R. ...	Lieut., R.N.D. (*killed in action*)	A.M.I.E.E.
Bates, T. O. H. ...	2nd Lieut., Indian Infantry (*died of wounds*)	A.M.I.E.E.
Bowker, R. B. ...	Major, R.E. (*died*)	A.M.I.E.E.
Bradbury, G. S. ...	Sergt., Manchester Regiment (*died of wounds*)	A.M.I.E.E.
Britton, H. E. ...	2nd Lieut., R.F.A. (*died of wounds*)	A.M.I.E.E.
Brydon, A. W. ...	Lieut., Queen's Royal West Surrey Regiment (*killed in action*)	A.M.I.E.E.
Bumpus, B. E. ...	2nd Lieut., North. Fusiliers (*killed in action*)	A.M.I.E.E.
Cardew, J. H., M.C. ...	Lieut., R.F.A. (*died of wounds*)	A.M.I.E.E.
Challoner, T., M.C. ...	Lieut., R.E. (*died of wounds*)	A.M.I.E.E.
Clears, P. J.	Sapper, R.E. (*killed in action*)	A.M.I.E.E.
Cunliffe, J. G., M.C. ...	Capt., Man. Regiment (*died of wounds*)	A.M.I.E.E.
Davidson, H. J. G. ...	2nd Lieut., Lancs. Fusiliers (*killed in action*)	A.M.I.E.E.
Doig, A. M., D.C.M. ...	Private, Man. Regiment (*died of wounds*)	A.M.I.E.E.
Downey, W. E. ...	Capt., R.A.O.C. (*drowned*) ...	A.M.I.E.E.
Ducsbury, T.	Private, Royal Berks. Regt. (*died*).	A.M.I.E.E.
Dutch, E. J.	2nd Lieut., Royal Fusiliers (*died of wounds*)	A.M.I.E.E.
Dyke, G. B.	Lieut., Royal Garrison Artillery (*killed in action*)	A.M.I.E.E.
Elkins, C. A. I. ...	Sapper, R.E. (*died*)	A.M.I.E.E.
French, Hon. E. F. ...	2nd Lieut., R.F.A. (*died*) ...	A.M.I.E.E.
Gibson, J. S.	2nd Lieut., Bedford Regiment (*died of wounds*)	A.M.I.E.E.
Gilbert, J.	Private, Man. Regiment (*died of wounds*)	A.M.I.E.E.
Gillespie, W.	Major, R.E. (*killed in action*)	A.M.I.E.E.
Handcock, R. H. ...	Lieut., R.A.O.C. (*died*)	A.M.I.E.E.
Henry, W. J.	Sub.-Lieut., R.N.D. (*killed in action*)	A.M.I.E.E.
Hickie, C. S.	Lieut., R.A.F. (*died of wounds*)	A.M.I.E.E.
Hoggett, F. R. ...	2nd Lieut., Royal W. Surrey Regt. (*died of wounds*)	A.M.I.E.E.
Hoyle, E.	Lance-Sergeant, H.A.C. (*killed in action*)	A.M.I.E.E.
Hulton, R. P. ...	Corp., Div. Engineers, R.N.D. (*died of wounds*)	A.M.I.E.E.
Hunstone, W. H. ...	Major, Embarkation Staff (*died*)	A.M.I.E.E.
Hurlbatt, E. S., M.C.	Lieut.-Col., Lanc. Fusiliers (*killed in action*)	A.M.I.E.E.
Hyde-Thomson, D. H.	Lieut.-Col., R.F.A. (*accidentally killed*)	A.M.I.E.E.
Labour, H.	French Army (*killed in action*)	A.M.I.E.E.
Langdon, W. C. C. ...	Lieut., R.G.A. (*died of wounds*)	A.M.I.E.E.
Laurie, D. S., O.B.E. ...	Captain, R.E. (*died*)	A.M.I.E.E.
Lloyd, N. V.	Private, Manchester Regt., (*killed in action*)	A.M.I.E.E.
Marsh, H. H. S. ...	Major, R.E. (*killed in action*)	A.M.I.E.E.
Middleton, E. J. ...	Staff-Sergeant, R.E. (*died*)	A.M.I.E.E.
Miller, F. S.	2nd Lieut., R.E. (*died of wounds*)	A.M.I.E.E.
Moffet, J. L.	2nd Lieut., R.S. Fusiliers (*killed in action*)	A.M.I.E.E.
Moore, B. J., M.C. ...	Captain, R.A.F. (*accidentally killed*)	A.M.I.E.E.
Murray, J. H., D.S.M.	A.-Sergeant, Div. Engineers, R.N.D. (*killed in action*)	A.M.I.E.E.
Newman, V. W. ...	Captain, Loyal North Lancs. Regt. (*killed in action*)	A.M.I.E.E.
Palmer, J. H.	Lieut., Royal Fusiliers (*killed in action*)	A.M.I.E.E.
Philips, T. F.	Private, Mortar Bat. (*killed in action*)	A.M.I.E.E.
Pink, H. W.	2nd Lieut., R.E. (*died of wounds*)	A.M.I.E.E.
Powell, C., M.C. ...	Captain, R.E. (*died of wounds*)	A.M.I.E.E.
Read, A. H.	Lance-Corp., Div. Engineers, R.N.D. (*died of wounds*)	A.M.I.E.E.
Russell, G. L. L. ...	Captain, R.E. (*died*)	A.M.I.E.E.
Rutherford, J. A. ...	Capt., M.G.C. (*killed in action*)	A.M.I.E.E.
Scrivener, R.	Sergt., Royal Fusiliers (*killed in action*)	A.M.I.E.E.
Solomon, L.	2nd Lieut., K.O.S. Borderers (*killed in action*)	A.M.I.E.E.
Symmes, H. C. ...	Major, S.A. Infantry (*killed in action*)	A.M.I.E.E.
Turner, H. E.	Capt., R.G.A. (*killed in action*)	A.M.I.E.E.
Tilley, F. E.	Sapper, Divisional Engineers, R.N.D. (*died of wounds*)	A.M.I.E.E.
Ward, C. R.	2nd Lieut., R.E. (*killed in action*)	A.M.I.E.E.
Whitaker, G.	Captain, Indian Army (*died*)	A.M.I.E.E.
Wilson, G. H.	Lieutenant, R.E. (*died*)	A.M.I.E.E.
Winkworth, W. ...	2nd Lieut., North. Fusiliers (*died of wounds*)	A.M.I.E.E.
Wolstenholme, C. S. ...	Lieut., Durham L.I. (*killed in action*)	A.M.I.E.E.
Wood, A. L.	Capt., Lancs. Fusiliers (*killed in action*)	A.M.I.E.E.
Wright, C. V. C. ...	Lieut., R.A.F. (*accidentally killed*)	A.M.I.E.E.
Young, C. R. M. ...	A.-Major, R.G.A. (*died of wounds*)	A.M.I.E.E.

Downes, H. L.	...	Lieut., Liverpool Regiment (*killed in action*)	A.I.E.E.
Gardner, A. ...	..	Major, R.E. (*killed in action*)	A.I.E.E.
Pilkington, S.	...	Capt., Leicestershire Regt. (*killed in action*)	A.I.E.E.
Saltren-Willett, A. J.		Lieut.-Colonel, R.G.A. (*killed in action*)	A.I.E.E.

Brown, H. A....	...	2nd Lieut., Scottish Rifles (*killed in action*)	Grad.I.E.E.
Butler, H. ...	...	Lieut., R.A.F. (*killed in action*)	Grad.I.E.E.
Eardley-Wilmot, G. H.		2nd Lieut., M.G.C. (*died of wounds*)	Grad.I.E.E.
Mac-Indoe, G.	...	Private, New Zealand Signal Section (*killed in action*)	Grad.I.E.E.
Orchiston, G. J.	...	New Zealand Expeditionary Force (*died of wounds*)	Grad.I.E.E.
Walker, R. B., M.C.	...	Captain, W. Yorkshire Regt. (*died of wounds*)	Grad.I.E.E.
Warburton, P. A. E.	...	Sapper, New Zealand Engineers (*died of wounds*)	Grad.I.E.E.

Bannister, E. G.	...	Captain, R.A.F. (*accidentally killed*)	Stud.I.E.E.
Baker, H. G. ...	...	Captain, Gloucester Regt. (*killed in action*)	Stud.I.E.E.
Barlow, L. M., M.C.	...	Flight Commander, R.A.F. (*accidentally killed*)	Stud.I.E.E.
Barnett, E. J.	...	2nd Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Bellamy, H. E.	...	Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Bower, H. A. ...	...	Flight Lieut., R.N.A.S. (*accidentally killed*)	Stud.I.E.E.
Burleigh, R. ...	...	Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Burrage, C. J.	...	Lance-Corporal, R.E. (*died of wounds*)	Stud.I.E.E.
Butler, A. E. W.	...	Lieut., Loyal Berks. Regt.	Stud.I.E.E.
Byng, H. G. ...	...	2nd Lieut., Border Regiment (*killed in action*)	Stud.I.E.E.
Cam, A. M. ...	...	2nd Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Castle, R. L. ...	...	Private, Royal Warwickshire Regt. (*killed in action*)	Stud.I.E.E.
Cheshire, J. ...	...	Private, Manchester Regt. (*died*)	Stud.I.E.E.
Claeys, W. R. E.	...	Corporal, Belgian Army (*died*)	Stud.I.E.E.
Coomba, C. S....	...	2nd Lieut., R.W. Kent Regt. (*died of wounds*)	Stud.I.E.E.
Cope, E. L. N.	...	Gunner, R.H.A. (*killed in action*)	Stud.I.E.E.
Corke, H. W. ...	...	2nd Lieut., Glos. Regiment (*killed in action*)	Stud.I.E.E.
Cunningham, P. N.	...	2nd Lieut., H.L.I. (*killed in action*)	Stud.I.E.E.
De Pomeroy, N. R.	...	2nd Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Donald, J. A....	...	Sapper, Divisional Engineers, R.N.D. (*died*)	Stud.I.E.E.
Douglas, W. A.	...	Capt., Royal Scots Regiment (*killed in action*)	Stud.I.E.E.
Eaddy, C. T. ...	...	2nd Lieut., N. Staff. Regt. (*killed in action*)	Stud.I.E.E.
Eagle, F. W. ...	...	Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Edinborough, N. D.	...	2nd Lieut., Midd. Regiment (*killed in action*)	Stud.I.E.E.
Ferranti, B. Z. de, M.C.		A.-Major, R.G.A. (*died of wounds*)	Stud.I.E.E.
Fisher, D. G. ...	...	Sub-Lieut., R.N.V.R. (*died*)	Stud.I.E.E.
Foote, N. V. ...	...	Trumpeter, Australian Light Horse (*died*)	Stud.I.E.E.
Forbes, J. ...	...	2nd Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Fricake, G. M.	...	2nd Lieut., Oxford. & Bucks. L.I. (*died of wounds*)	Stud.I.E.E.
Goodwin, J. J.	...	Gunner, M.G.C. (*killed in action*)	Stud.I.E.E.
Gudgeon, S. ...	...	2nd Lieut., Manchester Regt. (*killed in action*)	Stud.I.E.E.
Hill, C. H. ...	...	Private, Canadian Infantry (*killed in action*)	Stud.I.E.E.
Hunt, F. E. ...	...	Trooper, Sussex Yeomanry (*killed in action*)	Stud.I.E.E.
Kerman, W. H. P.	...	1st Class A.M., R.N.A.S. (*died*)	Stud.I.E.E.
Killingback, S. G.	...	Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Linay, R. E. ...	...	2nd Class A.M., R.A.F. (*killed in action*)	Stud.I.E.E.
Mahon, A. T....	...	Private, London Regiment (*killed in action*)	Stud.I.E.E.
Miller, C. W. ...	...	Lance-Corporal, Manchester Regiment (*killed in action*)	Stud.I.E.E.
Ogden, A. H. ...	...	Sapper, Divisional Engineers, R.N.D. (*died of wounds*)	Stud.I.E.E.
Organ, H. P....	...	Lieut., Yorkshire and Lancashire Regt. (*killed in action*)	Stud.I.E.E.
Palmer, W. S. H.	...	2nd Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Ponter, H. W. F.	...	Lieut., London Regiment (*killed in action*)	Stud.I.E.E.
Pullen, W. W.	...	Sapper, Divisional Engineers, R.N.D. (*died*)	Stud.I.E.E.
Rawson, S. M.	...	2nd Lieut., Royal Fusiliers (*killed in action*)	Stud.I.E.E.
Reeves-Smith, D.	...	2nd Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Slater, E. C. H.	...	Private, Manchester Regt. (*killed in action*)	Stud.I.E.E.
Smith, W. K....	...	Orderly, Friends' Ambulance Unit (*died*)	Stud.I.E.E.
Snowden, S. J.	...	Capt., Middlesex Regiment (*killed in action*)	Stud.I.E.E.
Stafford, R. ...	...	Lance-Corpl., M.G.C. (*killed in action*)	Stud.I.E.E.
Swinton, E. ...	...	2nd Lieut., R.F.A. (*died of wounds*)	Stud.I.E.E.
Taylor, A. T. ...	...	Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Thornton, J. M.	...	Lieut., R.E. (*killed in action*)	Stud.I.E.E.
Trouton, D. G.	...	Capt., R.F.A. (*killed in action*)	Stud.I.E.E.
Turton, T. C. ...	...	2nd Lieut., Liverpool Regt. (*killed in action*)	Stud.I.E.E.
Warden, E. A.	...	Canadian Field Artillery (*accidentally killed*)	Stud.I.E.E.
Wilson, E. W.	...	2nd Lieut., West Yorkshire Regiment (*killed in action*)	Stud.I.E.E.
Wilson, T. P. ...	...	2nd Lieut., Bedford. Regt., (*killed in action*)	Stud.I.E.E.
Winkley, S. H.	...	Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Woodside, H.	...	Divisional Eng., R.N.D. (*died*)	Stud.I.E.E.
Wormull, C. F.	...	Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Young, A. Y....	...	2nd Lieut., Royal Scots Fus. (*killed in action*)	Stud.I.E.E.
Young, C. ...	...	Lieut., R.A.F. (*killed in action*)	Stud.I.E.E.
Young, H. V....	...	2nd Lieut., R.A.F. (*died of wounds*)	Stud.I.E.E.

The Institution of Electrical Engineers was represented at the above Service by the following :—

Mr. G. W. Partridge, Vice-President, representing the President (Mr. C. H. Wordingham, C.B.E.), who was unavoidably absent ; Mr. W. M. Mordey, Past President ; Sir John Snell, Past President ; Mr. C. P. Sparks, Past President ; Mr. J. Devonshire, Colonel H. C. Sparks, C.M.G., D.S.O., M.C., and Mr. A. P. Trotter, Members of Council ; Mr. P. F. Rowell, Secretary ; and Mr. R. H. Tree, Chief Clerk.

Automatic Sub-stations.—An article in the *Electric Railway Journal* of March 22nd describes features wherein the automatic sub-station of the Butte Electric Railway differs from others hitherto installed. The maintenance cost for this station is more than 40 per cent. less than estimated, and the company is planning to extend automatic operation. Comparisons are given between the relative characteristics of automatic and manually operated stations containing machines of the same type, style and capacity. A case is cited in which the installation of an automatic sub-station at a centre of load distribution made possible considerable saving in capital and operating costs, compared with the alternative of additional feeder copper. Similar saving could not have been realised by a manually operated sub-station. In the automatic sub-station, containing two rotary converters (500 KW., 60 cycles, 600 volts, 6-phase, full-load rating 834 amp.), the total annual charge for material and maintenance was $355.80, of which $292 was for labour. The automatic sub-station failed only four times during the year, and then for minor reasons; most of these can be eliminated in future. The automatic sub-station has shown its ability to deal with short circuits without flashing. This is due to the use of flash guards and load limiting resistors which have a cushioning effect. Lightning does less damage in the automatic substation than in a manually controlled sub-station. In the original article equipment is described and illustrated, and useful references are given to other articles on automatic sub-stations.

Flexible Electric Heaters.—A writer in *Elektrische Kraftbetriebe und Bahnen* of March 14th describes the development of flexible electric heaters made by his works for war purposes. The clothing of airmen was at one time heated electrically by A.C. taken from the wireless equipment, but as this was found to impede the reception of acoustic signals, D.C. was substituted by means of dynamos of 200 watts output at 50 volts. The rubber shutters of photographic cameras for use on aircraft were heated by two flexible heaters of 30 watts capacity each, to keep the rubber pliable at low air temperatures, and similar heaters were placed in contact with the clockwork actuating the rolls of films. Boxes lined with flexible electric heaters of about 30 watts capacity were made to enclose the vital parts of machine guns on aircraft. The control levers of aeroplanes were heated by flexible cords. The heaters of airmen's clothing were composed of a core of asbestos with resistance wire wound in a spiral around it. Illustrations and descriptions are also given in the original article of heated gloves, muffs and boots. In the case of the gloves special heaters were devised for the finger tips.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

(*Continued from page* 741.)

As we anticipated in our last issue, the Convention of 1919 proved to be in every respect worthy to rank with its most noteworthy forerunners; it was, in fact, a phenomenal success, and we cordially congratulate the President, Mr. F. Ayton, to whom the success was so largely due, and his colleagues and assistants on the happy outcome of their labours. The members present numbered 280, and were accompanied by between 50 and 60 ladies; headquarters was at the Felix Hotel, Felixstowe, but even that roomy building, with the help of the Orwell and Grand Hotels, was unable to accommodate all the visitors, some of whom were provided with rooms elsewhere. In passing, we may put on record the general feeling of appreciation of the successful endeavours of the manager, Mr. P. T. Humphrey, to ensure the comfort of his guests, hampered though he was by the fact that the hotel had been in military occupation until a few months ago, and his staff was necessarily somewhat new to the establishment. Glorious weather prevailed on Wednesday and Thursday, and when the rain came on Friday, the knowledge that it was a godsend to the country went far to mitigate the loss of fair weather to the party.

The proceedings opened on Wednesday morning, at the Public Hall, Ipswich; a special train from Felixstowe and special cars in Ipswich conveyed the members to the rendezvous, where the Mayor of Ipswich, Mr. E. C. Ransome, J.P., chairman of the Electric Supply and Tramways Committee, extended to the visitors a hearty welcome. He considered that the meeting was likely to be one of the most important in the annals of the Association, and expressed gratification at the election to the office of president on that occasion of the electrical engineer and tramway manager, Mr. Ayton, to whose energy and ability he paid a hearty tribute.

Mr. Ayton, having thanked the Mayor on behalf of the Association, then read his address, an abstract of which appeared in our last issue; he remarked that since the address was written the appointment of Sir J. Snell to the office of Chief Electricity Commissioner had been announced, which would go far to gain the confidence of the municipal undertakings in the policy of the Government.

On the motion of Mr. T. Roles, vice-president, a vote of thanks was awarded to the president for his address, and Mr. Ayton announced that on the occasion of the visit to the seaplane station the Air Ministry would take 10 members for flights; it was agreed that five members of Council and five others should have that privilege, and the result of a ballot was that Messrs. J. H. Bowden, E. E. Hoadley, W. T. Kerr, S. J. Watson, and Colonel A. Sinclair, members of Council, and Messrs. S. Baker, D. L. Connal, S. E. Day, J. F. Magoris, and A. Wilkinson, were the winners.

It was also specially announced that contractors' representatives had not been invited to the meeting, and any present were requested to withdraw.

Alderman W. Walker, A.M.I.E.E., then read his paper, of which an abstract is concluded in this issue.

An interesting and useful discussion followed, which was almost confined to councillors and aldermen, several of whom were working men. The members then dispersed for luncheon, after which local works were visited.

The majority of the members elected to inspect the Corporation electric power station, tramway depôt, repair shops, and electric vehicle garage, whither they were taken in special tramcars. The chief object of interest at the electricity works was a Brush-Ljungström 3,750-K.V.A. turbo-alternator, some of the parts of which were awaiting erection. The garage was also a centre of attraction; here provision is made for charging the batteries of five vehicles from motor-generators, as well as two vehicles direct from the mains. There are in Ipswich two vehicles belonging to the Corporation and 14 private electric vehicles, of which six belong to the Great Eastern Railway; they are mostly of 2½ tons capacity, and use the "Ironclad Exide" batteries, which are repaired when necessary by the Corporation staff.

From the power station the party was conveyed by car to the Orwell works of Messrs. Ransomes, Sims & Jefferies, Ltd., where a factory covering 2½ acres, erected in 1917 for the construction of aeroplanes, has been adapted to accommodate the electric vehicle department of the company, of which some particulars are given elsewhere in this issue. Specially interesting features of the Orwell works are the laboratory and test-room, where all the materials used are subjected to physical, chemical and microscopical examination; the machine shop contains a variety of up-to-date tools, of which the helical gear-cutting machines attracted special attention. The substantial construction and high-class workmanship of the chassis and electrical apparatus were particularly noteworthy.

Leaving the works, the party attended a demonstration of pneumatic tools for road-breaking, operated by a Reavell motor-driven air-compressor mounted on an electric truck and fed by a storage battery. The members then proceeded by car to Christchurch Park, where they were the guests of the Mayor at afternoon tea, and visited the Mansion, a fine Elizabethan building which is used as a picture gallery and museum. This part of the day's programme was not the least enjoyable, and the Mayor and Mayoress were cordially thanked on behalf of the visitors by the President. The Ranelagh works of Messrs. Reavell and Co., Ltd., and the Waterside Works of Messrs. Ransomes & Rapier, Ltd., were also open to inspection, the former being noted for the manufacture of electrical and steam-driven air-compressing plant, and the latter for the Stokes gun (in war-time), heavy electric cranes, hydraulic sluices for the Assuan and other dams, &c.

The many historic associations and antiquities of Ipswich would have justified a longer stay, but "according to plan" the party returned to Felixstowe to dine, and spent the evening as their inclination directed. Two important meetings were held, however, at 9 p.m.—a special meeting of Committee members to consider the circular letter and scale of salaries put forward by the Associated Municipal Electrical Engineers, and a meeting of the members of the A.M.E.E. which, we may suppose, was engaged on very similar lines, but viewed the question from a different standpoint.

On Thursday morning the Association met at 10 a.m. in the Spa Pavilion, Felixstowe—an admirable place for the purpose, where the severely technical aspect of the morning's business was off-set by the glorious sunshine and a clear view of the sunlit sea. A discussion on "Electric Transmission Considerations" was opened by a valuable paper read by Mr. S. L. Pearce, M.Sc., C.B.E., chief electrical engineer, Manchester, who pointed out that every case must be considered separately upon its merits, but after traversing the whole field exhaustively, gave a mass of data and estimates which indicated that the economic superiority of overhead transmission as compared with underground cables (on the basis of 60,000 volts) was by no means a deciding factor in the choice of method, while there were strong arguments in favour of the cable. An abstract of the paper will be given in our next issue.

The discussion was noteworthy for the attendance, by invitation of the Council, of several eminent experts in cable manufacture and electric transmission, who made valuable contributions to the debate. Mr. B. Welbourn, by permission of Mr. Wordingham, stated that the I.E.E. Committee on the Heating of Underground Cables had found that for underground transmission the armoured cable laid direct in the ground was undoubtedly the best, carrying over 30 per cent. more current than cables in ducts, other things being equal; the cable laid solid, however, ran the armoured cable very close. Further, an I.E.E. Committee had been set up, on the initiative of Mr. Wordingham, to co-ordinate existing regulations for overhead lines, and a Sub-Committee on the subject of safety had drafted a new set of standards which it was hoped would be adopted in place of the present Board of Trade Regulations. Mr. Fedden held that it was cheaper to carry coal than to transmit electricity 30 or 40 miles,

and that all main lines would have to be underground. Mr. Beaver agreed that the future lay with underground cables, but Mr. Wordingham held that the case was not proved yet, and Mr. W. Burr supported that view. Mr. Chattock favoured the cable. The paper was generally regarded as one of the best on a technical subject for many years.

A paper on the "Rating of Electric Supply Undertakings," by Bailie W. B. Smith, Glasgow, was then read and discussed. The author pointed out the absurdities of the existing system, based on an Act of Elizabeth, and called for a complete revision of the system of local taxation. In the discussion this demand was strongly supported, and a resolution was passed instructing the Council to take action with a view to impressing upon Parliament the importance of dealing with the question of assessment and valuation of public utilities.

The afternoon was devoted to a visit to the Felixstowe Air (Seaplane) Station and Workshops, the programme having been changed. Two seaplanes were ready for the visitors, and made several flights, carrying the members above named, whose departure and return were watched with keen interest by their less fortunate confrères. The Air Station has been one of the most active of our aviation centres during the war, and has done splendid work in fighting the Hun. A specially interesting machine was a triplane with five engines, which flies daily, and could easily accomplish the trip across the Atlantic if permission were granted by the Government.

In the evening the annual dinner—the first since 1914—was held at the Felix Hotel, Mr. Ayton presiding. The toast list was a lengthy one. After the loyal toasts, Councillor Bruce Lindsay proposed "The Imperial Forces of the Crown," and pointing out that our Army and Navy had bought our liberty at a great price, he urged that we should live worthily of those who had fought and died for us. Rear-Admiral C. F. Thorpe, R.N., Senior Naval Officer, Harwich, in the course of his reply, referred to the part played in the war by the workers at home, and emphasised the importance of electrical power in the manufacture of munitions of war.

Mr. T. Roles proposed "The Ipswich Corporation," and referring to the good work put into the Orwell chassis, urged the importance of publicity in developing the industry. He pointed out also the advantages derived from the election as councillors of engineers such as the Mayor of Ipswich, Councillor E. C. Ransome, who, in reply, remarked that the future prosperity of Ipswich depended upon a cheap supply of electric power, and expressed the hope that the workmen would ask for more power to be provided to increase the productiveness of their labour. There was no likelihood of extensive linking-up in East Anglia, but they were going in for considerable extensions to their electricity works, and had been told that when the national scheme was carried out, Ipswich would be the "electrical mother" of an area of 20 miles' radius.

Mr. L. L. Robinson, who came to the Convention in a sailing yacht, and had a lively experience in entering the River Deven, proposed "The U.D.C. of Felixstowe," and commended the wisdom of the Council in allowing a company to supply the town with electricity, as Felixstowe was famous for sunshine, and had no power load, so that the load factor must be rotten! The chairman, Mr. W. F. Cross, briefly replied.

Mr. C. H. Wordingham, C.B.E., President I.E.E., in proposing "The I.M.E.A.," said that the Association was now at the summit of its influence; profound changes were about to take place, but municipal engineers would retain the distribution of electrical energy, and the Association would continue its career of usefulness. The President, Mr. Ayton, had done splendid work in promoting the use of electric vehicles, and fully realised the undoubted value of publicity; as President of the Association he had conducted the proceedings with conspicuous tact, good humour, and ability.

Mr. Ayton, in reply, agreed that under the new *régime* it would be as necessary as before to have a strong Association capable of voicing the views of municipalities and keeping in order the Electricity Commissioners and the District Boards.

Alderman Walker, in a humorous speech, proposed "Our Guests (including the Ladies)," and Sir Wilfrid Stokes K.B.E., replied with equal wit. He reproached electricity suppliers for surrounding their contracts with so many difficulties and conditions, hindering would-be consumers from taking a supply—they should sweep away all these irksome and repellent conditions.

Mr. Ayton proposed "The Engineering Firms of Ipswich," and Councillor W. Reavell, in reply, stated that his firm 21 years ago adopted electric power throughout, and had never regretted it.

On Friday morning the annual general meeting took place; the annual report and accounts were adopted, and the result of the ballot for new officers and Council was announced as follows:—

President, Mr. T. Roles (Bradford).
Vice-President, Mr. S. T. Allen (Wolverhampton).
Hon. treasurer, Mr. H. Faraday Proctor (Bristol).
Hon. secretary, Mr. A. C. Cramb (Croydon).
Members of Committee:—
Large towns: Mr. S. L. Pearce (Manchester).
Mr. W. W. Lackie (Glasgow).
Major H. Richardson (Dundee).
Colonel W. A. Vignoles (Grimsby).
Small towns: Mr. S. E. Britton (Chester).
Committee members:—
Councillor Barge.
Councillor Robinson, M.P.

Miss Lanfear, Electricity Works, Croydon, had been appointed secretary *pro tem.*

Mr. Chattock emphasised the importance of a publicity campaign to develop the use of electric vehicles, and pointed out that the subscriptions received by the Electric Vehicle Committee from municipalities were insignificant compared with those of other bodies. The *Electric Vehicle* would in future be issued monthly instead of quarterly.

In view of the deficit in the accounts for the past year, due to the high cost of printing and stationery, it was agreed that Committee members should be requested to contribute £2 each additional for the coming year.

The resignation of Alderman Pearson, hon. solicitor, was accepted with great regret, and Mr. J. E. Edgecombe was elected an honorary member. The president referred to the splendid work done by Mr. H. Faraday Proctor as a member of the Council from the commencement and hon. secretary for 14 years; at a later stage Mr. T. W. Purse, as one of the more turbulent members, emphasised the indebtedness of the members to Mr. Proctor, and testified to his invariable courtesy, promptitude, and good temper; a resolution expressing the appreciation of the Association of his services was carried with acclamation. Votes of thanks to the President, the local authorities, and others were recorded, and a special meeting was held to adopt various minor alterations in the articles of association. The place of next year's meeting was left to Mr. Roles and the Council.

In the afternoon, in spite of rainy weather, a large party of members was taken in naval motor launches for a cruise of inspection of the war vessels lying in the harbour, and up the Stour estuary to view the German submarines and a German submarine salving ship. Apart from that afternoon, the weather throughout had been all that could be desired, and the Convention was unanimously regarded as exceedingly successful.

THE NEW PRESIDENT.

Mr. Thomas Roles, M.I.E.E., born at Brighton in 1875, commenced electrical work in 1891, and was successively engaged in the electricity supply undertakings at Hove, Aberdeen, Leicester, and Poplar. In 1904 he became chief assistant electrical engineer to the Bradford Corporation, and in 1907 he was appointed chief electrical engineer and manager; in that capacity he carried out the installation of the whole of the three-phase plant, rated at 20,000 KW., and is now erecting two turbo-generators of 15,000 KW. each. The total capital expended on the Bradford electricity undertaking is over £1,200,000, of which more than £700,000 has been spent during Mr. Roles's connection with the department; he has also given special attention to the commercial development of the

undertaking, and the annual output during the past two years has exceeded 50 million units.

Mr. Roles has been chairman of the Yorkshire Local Section of the I.E.E., and is now chairman of the Yorkshire Electricity Supply Linking-up Committee; he was a member of the Electric Power Supply Committee of the I.E.E. and of the National Electric Power Supply Joint Committee. For some time during the war he acted as a representative for the Yorkshire district for the Controller of Coal Mines, but was obliged to give up these duties in consequence of a breakdown in health in May, 1918, which rendered it necessary for him to take a complete rest from all business for several months. He has served

Photo, by] MR. THOMAS ROLES. *[Lafayette.*

on the Council of the I.M.E.A. almost continually since 1912, and his genial personality, combined with an inexhaustible fund of humour and sound practical all-round ability, ensures the success of his term in the presidential chair.

The Whitley Report and the Electricity Supply Industry.

BY. ALD. W. WALKER, A.M.I.E.E.

(*Abstract.*)

(*Concluded from page* 741.)

In June of last year it was decided to submit a draft scheme—drawn up by the engineer and manager and approved by the Electricity Committee—to a mass meeting of the workers of the Manchester Corporation Electricity department. First of all, a printed copy of the proposed scheme was supplied to each employé, then a public hall in the city was hired, and, after an explanatory statement had been made by the writer, questions and suggestions were invited. Afterwards a vote was taken, and by a large majority the following scheme was adopted:—

SCHEME APPLYING THE RECOMMENDATIONS CONTAINED IN THE WHITLEY REPORT TO THE ELECTRICITY DEPARTMENT OF THE MANCHESTER CORPORATION.

1. *Object.*—To bring forward matters of mutual interest, and those which in the opinion of the men stand in the way of harmonious working. Generally to promote the welfare of the employés and a close feeling between the management and the employés, and to work in conjunction for the mutual benefit of all.

The scheme is in no way intended to interfere with the rights or status of existing trade unions or associations.

The following are cited as matters that could very well come within the purview of the Works Committees:—

(*a*) Co-operation and improved methods of carrying out the work.
(*b*) Conditions of employment.
(*c*) Class of labour employed on certain operations.
(*d*) Co-operation in supervision.
(*e*) Shop troubles.
(*f*) Formation of shop rules.
(*g*) Employment of ex-soldiers.
(*h*) General welfare.

It is hoped that the scheme will not develop into a manufactory of grievances pure and simple, but should rather provide a means for a frank exchange of opinions.

Any general movement of wages, or raising of rates of pay to any class of employés or to any individual would not be a fit subject to be considered by the Works Committees or the Central Works Council, but would be dealt with by means of the existing machinery, viz., the trade unions and the Employers' Federations, or—when formed—the National Industrial Councils.

It is necessary, therefore, to clearly define at its inception the scope of the scheme as broadly set forth above, together with the matters which could be brought before the Committees and Council.

2. *Constitution of the Works Committees.*—So far as practicable, each section of the department—including female employés in that section—should elect an employé representative on the committee, subject to the maximum number of 20 not being exceeded.

Every employé of 21 years of age and over, irrespective of status or grade, shall be eligible for election and to vote.

All elections to be by ballot—after nomination—and it is suggested that the first Committees should be elected for six months only.

The head of the department concerned shall conduct the ballot; two scrutineers to be appointed—one from the management and one from the employés.

Members of the staff would not be eligible for election to the committees as employé representatives, nor would they participate in the ballot.

The management will not be represented by an equal number, but a less number, and four representatives are suggested as being sufficient for any committee. They would be selected by the chief engineer and manager.

The real function of the management representatives would be to exercise a conciliatory and advisory influence over the Works Committees, and to regulate the matters carried forward to the Central Works Council.

The opportunity presented to the management representatives of meeting the workmen's representatives on this committee should be taken advantage of to offer suggestions in regard to directions in which improvements could be effected. In other words, suggestions should not only be brought forward by the workmen, but also by the management.

The question has been raised as to whether it is desirable to constitute the Works Committees on the basis of "occupation" and "grade of workman" or "place of employment."

Bearing in mind that co-ordination will always be secured through the Central Works Council, it appears desirable—and would be a course more likely to stimulate interest and achieve the best results—to have the committees formed according to place of employment, *i.e.*, one for Stuart Street station, one for the city stations, and one for distribution.

Vacancies occurring on the committees would be filled by ballot.

Wherever the term "employé" is used in this scheme the reference is to those outside the staff grade.

The following representation is proposed for the undermentioned respective Works Committees with which to commence the scheme:—

(*a*) STUART STREET STATION.

Boiler houses: Operating staff	3
Turbine Room: Operating Staff	2
Building section	1
Shop repairs section: 1 tradesman—mechanical; 1 tradesman—electrical; 1 non-tradesman	3
Railway	1
*Women	1
Management	4
Total	15

(*b*) DICKINSON STREET AND BLOOM STREET STATIONS.

Boiler houses: Shift men	1
Engine rooms: Shift men—mechanical (1); shift men—electrical (1)	2
Shop repairs section: Tradesman (1); non-tradesman (1)	2
Coaling	1
Building	1
*Women	1
Management	2
Total	10

(*c*) DISTRIBUTION.

Mains department: 1 jointer; 1 meter fixer; 1 flagger or pavior; 2 non-tradesmen; 1 woman*	6
Sub-stations department: 2 shift attendants; 1 shift assistant; 1 tradesman; 1 non-tradesman	5
Testing department: 1 tradesman; 1 non-tradesman	2
Street lighting	1
Management	4
Total	18

* Elected by the vote of female employés only, which shall be additional to their sectional vote.

3. *Works Committees' Procedure.*—The Committees would elect their own chairmen and hon. secretaries from the representatives of the employés.

In connection with the duties of the latter position it will be necessary for the Corporation to arrange for the services of a stenographer and typist, and to supply the necessary stationery and postage, at the Corporation's expense.

Formal notice of meetings to be sent by the hon. secretaries to the members of the Works Committees.

The hon. secretary should keep proper minutes of the proceedings, and should also furnish to the Central Works Council, say seven days before the latter's meeting, a statement of the matters it is intended to bring forward, in order that the Council may have an opportunity of getting together all the necessary information in regard to the same in time for the meeting. This is essential so that the Council may be fully prepared to discuss and settle the questions without delay.

For a commencement, at any rate, it is not proposed to confer executive powers upon the Works Committees to deal with any question or group of questions, and therefore each committee must submit to the Central Works Council for approval or otherwise their recommendations and the decisions which have been agreed to by the head of the department concerned.

It is suggested that the committees should have power to call in any employé whose special knowledge of any particular matter would be useful.

4. *Constitution of the Central Works Council.*—The question of having representatives from each of the Works Committees upon the Central Works Council has been carefully considered.

It certainly seems desirable in order to secure a proper co-ordination of interests between the various sub-departments, and to deal with those subject matters which concern all branches of the electricity department, that representation should be accorded to each Works Committee.

On the other hand, it is not necessary for all the delegates to attend, and therefore the following constitution for the Council is put forward:—

Stuart Street Works Committee: Three representatives.—Chairman and hon. secretary and one other employé representative.

Dickinson Street and Bloom Street Works Committee: Two representatives.—Chairman and hon. secretary.

Distribution Works Committee: Three representatives.—Chairman and hon. secretary and one other employé representative.

Management: Seven representatives.—The chairman of the Electricity Committee, the deputy-chairman of the Electricity Committee, the chief engineer and manager, the deputy-chief engineer, the resident engineer, Stuart Street station, the financial superintendent, the mains engineer.

The management would also have the power to call in the head of any department, if necessary, for consultative purposes.

It is also suggested that the committees be allowed, if and when they thought it necessary, to elect and send a delegate, in addition to those referred to above, if it be considered owing to the nature of some particular matter to be brought forward that this additional delegate's knowledge would be helpful.

The chairman of the Central Works Council shall be elected by the members of the Council at the first meeting.

The Electricity Committee will provide the secretary of the Central Works Council.

A copy of the minutes of the Central Works Council shall be sent to each member of such Council one week before the meetings of those committees.

5. *Number and Place of Meetings.*—Each of the Works Committees will meet at their respective locations, viz., Stuart Street, Dickinson Street, and Polygon.

As a commencement, and until actual experience of the scheme has been obtained, it is suggested that the Works Committees meet from 11 a.m. to 12.30 p.m. on the first Wednesday in each month, and the Central Works Council at the same time on the third Wednesday in each month.

In addition, provision might be made authorising the convening of emergency meetings of the committees and council.

6. *Conclusion.*—The proposals contained in this scheme have been drafted for the sole purpose of applying the principles and recommendations of the Whitley Report to the Manchester electricity undertaking.

It is possible, however, that other undertakings in the district may do likewise.

From the several local electricity undertakings, therefore, a District Council could be formed.

To carry the ideas contained in the Whitley Report a stage further, a National Council may eventually be formed out of the various District Councils for the whole of the electrical supply industry of the country.

Obviously, this is a scheme for a large undertaking. Smaller undertakings would not require either three Workshop Committees or a Central Works Council, but would find one committee sufficient. The very small undertakings could with advantage arrange for the election of two or three delegates, who would have the right to meet the management at regular and stated times. At Manchester, the first committees were elected for six months, which period expired in January last. Before balloting for the new committees, meetings were held, of workpeople only, to vote for or against the continuance of the Workshop Committees. Very favourable opinions were expressed on the work of the committees, and the meeting decided that the next election should be for double the period, viz., twelve months. The monthly joint meetings do good. The free exchange of opinions is beneficial to both. It must always be remembered that whilst some of the workers' representatives have had much experience of committee work and procedure in connection with their trade unions, others have not had that advantage, therefore great tact ought to be exercised and every effort made to thoroughly understand the point of view which any member attempts to place before the committee. Many points of both principle and detail are omitted from this paper, and it is hoped that they will be dealt with by contributors to the discussion. Members will see where modifications are necessary to meet their own particular circumstances, and in the opinion of the author, the paper will have justified itself if it leads to a useful discussion of this important matter.

DISCUSSION.

Alderman WALKER remarked, in the course of the paper, that the Industrial Council had already held two meetings, and was engaged in defining the functions of the District Councils. It might be found desirable to give the force of law to the decisions of the Industrial Council, but he withdrew the emphasis which he had placed in the paper on the granting of plenary powers to delegates, as he found that it was *ultra vires* for local authorities to give such powers—the acts of a delegation or committee *must* come before the Council for confirmation or otherwise. When agreement had been attained by the Industrial Council, he hoped that the Government would make such agreement compulsory, as it would be necessary to coerce dilatory and backward councils and companies to conform with the views of the industry.

The District Councils ought to play a very important part in the working of the Whitley Report scheme; they would have local knowledge which was not accessible to the Industrial Council, and could arrive at agreements which the chief Council would enforce. As chairman of a small sub-committee he had put forward a scheme for the subdivision of the country into districts as a first step; he had proposed to make those districts coterminous with the electrical areas of the District Boards, but they could not wait for the latter areas to be defined. The London area was already in existence, as defined in the "Award No. 2,772," and was working extremely well. He asked members to advise the sub-committee as to suitable areas, but held that ultimately the Whitley districts should coincide with the electricity districts, to avoid the overlapping of industrial areas in which different regulations operated, in the same electrical district. With regard to the Workshop Committees, he laid great stress on the importance of *regular* meetings; the committees were not to be called together when a grievance had developed—they should anticipate such questions and settle them by discussion, usually a simple matter in the early stages. The workmen's representatives must be elected by ballot, entirely uncontrolled. Women being in a minority in every department, they ought to have a direct representative as well as a vote for the men's representatives.

Colonel SINCLAIR (Swansea) agreed with the contents of the paper, which he said would become a standard. Since 1901 he had had an agreement with his employés on the lines of the Whitley Report, which had worked extremely well. It was of the first importance to settle any complaint at once by impartial investigation and direct discussion with the men; the management should have wide powers to settle all matters which did not involve principles.

The MAYOR (Councillor E. C. Ransome) asked how a works committee should be run in a small town like Ipswich, with a number of different departments each employing a small number of men.

Mr. C. H. WORDINGHAM said that the fate of the country was in the balance; all depended on the attitude of Labour—if the men would not work, the country must go under. The employer had every desire to co-operate, but it was not so certain that the workman desired to co-operate with the employer. He believed the Whitley Report offered the best means yet devised to bring about that co-operation. Nothing could replace the personal touch; they should let the men see what difficulties the employers had to contend with. The paper was a most valuable one, but a body formed for a given purpose should confine itself to that purpose, and he thought that the Whitley Councils should not undertake research, which was in the hands of the Advisory Council. Alderman Walker's proposal to define industrial areas *pro tem.* was entirely practical and useful.

Mr. H. FARADAY PROCTOR said he had received many complaints that the smaller undertakings were not adequately represented on the Joint Industrial Council; the Association had only six representatives, and it was difficult to subdivide them amongst the undertakings. They were nominated by the Council on this occasion for one year only, but should be elected by the whole Association next time.

Alderman SMITH said that a strong executive hand was required to reorganise industry, and our educational system should be reformed to develop character.

Alderman JEPHCOTT (Birmingham) as a workman defended our educational system, and urged the members to support the Fisher Act. Poorly paid men could not be expected to increase production or to take broad views of commercial questions. He welcomed the Whitley Report, and declared that if the men were made to feel that they sat on the committees on terms of equality to discuss working conditions, those trifling difference which often became of national importance would not arise. He recognised the difficulty of giving plenary powers to the delegates on Industrial Councils, but said that in practice the local authorities would endorse the actions of their representatives. The Industrial Councils must eventually have compulsory powers of some sort. They would effect a revolution in shop practice, but would stabilise industry and promote confidence on the part of the workers, who would join hands with the employers in the defence of British trade and industry.

Councillor TOPPIN (Huddersfield), also a workman, raised the question of adequate pensions for men who were past work. The conciliatory methods of the Whitley Report would do far more good than the plan of waiting for a strike and then using "strong executive power." If the education of the workers was a failure, how much greater had been the failure of the educated classes who had only recently awakened to a consideration of the conditions of living of workpeople.

Councillor J. H. THOMPSON (Wolverhampton) declared that the British working man had more sense than any foreigner —a very important fact, which his experience had demonstrated. What was needed in dealing with him was human sympathy.

Councillor HUMPHREY (Mexborough), a working man, denied that the employer was more willing to co-operate than the workman. It was too much to hope that the Whitley Councils would abolish strikes, but strikes were not entered upon by workers for the love of striking, and they were anxious to give the system a trial.

Mr. LOGAN (Rotherham) said that the functions of the trade unions must not be interfered with, or a conflict would be inevitable.

Replying to the discussion, Alderman WALKER said that in small industries the workmen could elect two or three representatives who should have the right to approach the management at any time. Departments could not be combined. Economic problems were unknown to the workmen, who should be shown the facts by patient tuition. The Joint Industrial Council had no intention of doing any research work, but would encourage research in the hands of suitable bodies. Pensions were a national question affecting all industries, and could be dealt with by national insurance. No District Councils yet existed, as the areas had not been defined. The Councils could not act in opposition to the Trade Unions, which necessarily constituted half the Councils. The National Industrial Council was not part of the Whitley scheme.

ANNUAL REPORT.

The report of the Council for the year ending June, 1919, states that the membership of the Association stands at 395, made up as follows:—

Committees (Members)	182
Chief Electrical Engineers (Members)	184
Honorary Members	7
Chief Assistants (Associate Members)	2
Assistants (Associates)	20
	395

There is a net increase of ten in the total membership.

With regard to electric power supply, a general meeting of the Association was held at Birmingham on November 29th, at which a report from the Council was submitted and, subject to certain amendments, was approved and forwarded to the Board of Trade.

On February 14th the Council of the I.M.E.A. passed a resolution objecting to the proposed transfer of the future control of electricity supply from the Board of Trade to the proposed Ministry of Ways and Communications, and the members were invited to take the matter up with their Members of Parliament.

On March 6th, 1919, a communication was circulated to members of the House of Commons and to the members stating that the Association viewed with very grave concern the proposal to transfer the powers. As the consumption of electricity by railways was never likely to exceed, say, 10 per cent. of the national electricity supply in aggregate, it was difficult to see how the interests of the general manufacturing community, who were by far the largest users of electricity, could be adequately protected by the proposed Ministry of Ways and Communications, whose predominating interest would undoubtedly be railways. It was therefore strongly urged that the control of the electricity supply industry should be vested in the Board of Trade.

In a further circular dated April 1st it was stated that it was imperative that the Board of Trade Electricity Supply Bill should be presented to Parliament forthwith; members of the Association and M.P.'s were asked to secure this.

Several members visited the House of Commons on various occasions, interviewing individual Members of Parliament, and were received by the Electricity Committee of the Commercial Committee of the House. As a result of the representations made, all reference to electricity in the Ways and Communications Bill was withdrawn, but reappeared in the long-looked-for Electricity (Supply) Bill. A special general meeting of the Association was held in London on May 16th to consider the Electricity (Supply) Bill; and a circular setting forth the decisions of the meeting was circulated to Members of Parliament and of the Association. (Abstracted in the ELECTRICAL REVIEW, May 30th, p. 624.)

Following upon a meeting in Manchester in June, 1918, between representatives of the electric supply industry and the Trade Unions, a committee representative of electric supply undertakings and Trade Unions was set up to draft a constitution for the formation of a Joint Industrial Council for the electric supply industry. Several meetings were held and finally an agreed draft constitution was submitted for approval to the Associations representing the employers—both municipal and company—and to the Trade Unions concerned. After considerable delay, approval to the draft was given by each of the constituent bodies concerned and the Council was formally set up. The Council appointed the following as the Association's representatives on the Joint Industrial Council: Councillor Burman, Birmingham; H. Faraday Proctor, Bristol; L. L. Robinson, Hackney; Bailie W. B. Smith, Glasgow; Alderman Vaughan, Maidstone; Alderman Walker, Manchester. Alderman Walker has been appointed chairman of the Council.

The Council of the I.M.E.A. draws the attention of members to the desirability of giving financial support to the work of the British Engineering Standards Association.

The Council has agreed with the B.E.A.M.A. to recommend the members of the I.M.E.A. to act in accordance with the following arrangements in the issue of specifications henceforth:—"A copy of every specification likely to be the subject of tenders by members of the B.E.A.M.A. to be forwarded to the secretary of that Association for deposit at their head office. One copy of specification to be supplied to *bona fide* manufacturers on receipt of a returnable fee (not to exceed £1 on contracts estimated at, say, less than £1,000, and not to exceed £5 in any case). Further copies to be supplied at a nominal charge not exceeding, say, £5. Specifications should as far as practicable be sectionalised in such a manner that the separate sections, tender forms, &c., and general conditions, may be made available at a nominal charge to enable firms having many departments to secure additional copies of particular sections when required for departmental purposes."

Regulations for the constitution of I.M.E.A. centres were approved at a special general meeting held at Birmingham on November 29th, 1918, and are printed in the report. The Council has officially recognised the E.P.E.A. as the body to be conferred with on the subject of the rates of remuneration and conditions of service of the technical staffs of electric supply undertakings. Last December the secretary, Mr. C. McArthur Butler, expressed a wish to be relieved of his duties owing to the many other calls upon his services, and his resignation was accepted with regret. On May 9th, Mr. H. Faraday Proctor tendered his resignation as hon. secretary, a position which he had held since 1904, owing to demands upon his time, and the resignation was accepted with great regret.

At the request of the Council, Mr. A. C. Cramb, past president and hon. treasurer, has accepted nomination as hon. secretary, and Mr. H. Faraday Proctor has consented to nomination as hon. treasurer.

The Standing Conference of Electrical Supply Associations, upon which the I.M.E.A. is represented, has frequently met to consider matters relating to rates of remuneration and conditions of employment in the electric supply industry, and to make recommendations thereon.

The Council is of the opinion, which has been communicated to the Standing Conference, that the Joint Industrial Council having come into existence, the Standing Conference is now redundant to the purpose for which it was set up. At the request of the National Association of Local Government Officers, the Council agreed to support a resolution to the effect that the Departmental Committee on Superannuation should recommend the introduction of a National Superannuation Scheme for the officers employed by local authorities in England, Scotland and Wales on a non-contributory basis, providing similar benefits to those granted to civil servants, and now proposed for teachers, with adequate provision for the present older officers in the service. At a special meeting of the Association held in Birmingham on November 29th the following resolution, proposed by Alderman Walker, of Manchester, and seconded by Alderman Barge, of Poplar, was carried unanimously:—"That in the opinion of this Association the higher officials employed in municipal electrical undertakings should have an increase in salary at least equivalent to the war awards." The engineering members took no part in the discussion or the voting upon this resolution. There appears to be little prospect of developing the use of electricity for agricultural purposes until the State Departments, entrusted with the governing powers relating to electricity supply and agriculture, remove the existing obstructions and encourage progress. The accounts show a deficit for the year of £88.

(To be continued.)

BUSINESS NOTES.

Government Sales of Electrical Machinery.—At a sale just conducted at the Anzac Factory, Glasgow, by the Disposal Board of the Ministry of Munitions, £91 was paid for a one-ton electric overhead runway hoist, which cost, when new, £44. A one-ton suspension electric hoist, which cost £57, was sold for £64. For a 10-H.P. shunt-wound D.C. electric motor, 240 volts, 790 revs., £75 was paid, a profit of £24; and for a similar motor, with double the power, which cost £73 10s., the sum of £122 was paid.

German Porcelain Syndicate.—It is reported that about 40 German firms concerned in the ceramic industry have combined, under the title of the Syndicate of German Electrotechnical Porcelain Works, for the mutual protection of their economic interests. All the firms concerned produce mainly insulators and porcelain insulating material for the electrical industry.

Plant for Disposal.—Felixstowe and Walton U.D.C. invites offers for two OE-size horizontal Stockport gas engines and two 20-KW. generators. For further particulars see our advertisement columns in this issue.

Coal Commission.—At a recent meeting of the Spelter Manufacturers' Association (Swansea), the following resolution was unanimously adopted:—

That this meeting of spelter manufacturers views with apprehension the suggestions for nationalisation of coal mines, fearing that such action will tend to increase the price of manufacturing coal and seriously affect all smelting industries, and they trust that the Report of the Coal Commission will not be accepted or acted on until sufficient steps have been taken to ascertain the effect of nationalisation of coal on industrial concerns.

The following resolution was adopted by the London Iron and Steel Exchange on June 17th, business being suspended for the purpose of considering the question:—

That this meeting of the members of the London Iron and Steel Exchange views with apprehension the suggestion for the nationalisation of coal mines, considering that such action will tend to increase the price of coal, and thereby seriously affect manufacturing costs throughout the country.

Dust Bellows.—Bellows suitable for blowing dust out of motors, dynamos, and inaccessible parts of other electrical apparatus have been very difficult to obtain during the war. We are informed that the "Z" Electric Lamp Manufacturing Co., Southfields, London, S.W. 18, is now in a position to supply this class of article. The bellows are made entirely of wood, the risk of shorts occurring being thereby eliminated.

This Year's Machinery Exhibition at Olympia.—The Shipping, Engineering and Machinery Exhibition which was to have been held in the autumn of 1914, but was postponed because of the war, will be opened at Olympia, on September 25th, by Lord Weir of Eastwood. Mr. F. W. Bridges is secretary and organising manager of the Exhibition, which is to remain open for three weeks. An official bulletin and prospectus that has been issued, includes a list of the exhibitors. Quite a number of electrical and allied manufacturers appear therein. We understand that all space on the ground floor has been taken, and the gallery spaces are nearly all occupied. The Exhibition offices are at 124, Holborn, W.C.

Exports to Sweden: Restrictions Withdrawn.—The Board of Trade are officially informed that the Swedish Government have given a general guarantee which has been accepted by the Associated Governments, that goods imported into that country will not be re-exported to enemy destinations. They announce, therefore, that except for goods on Lists A or B, all restrictions on export to Sweden whether by freight or by parcel post have now been removed. It is no longer necessary to consign any goods to importing associations or to official consignees in that country. Applications for licences to export goods on Lists A or B should continue to be made to the Export Licence Department (now situate at 1, Queen Anne's Gate Buildings, Westminster, S.W. 1.).

Exports to Denmark: Restrictions Withdrawn.—The Board of Trade are in receipt of information from the Foreign Office that the Danish Government having now given a general guarantee, which has been accepted by the Associated Governments, that goods imported into that country will not be re-exported to enemy countries. The Board of Trade announce that, except for goods on Lists A or B, all restrictions on export to Denmark, whether by freight or by parcel post, have now been removed. Exporters should, however, satisfy themselves that the goods are not subject to any Danish import prohibition. Applications for licences to export goods on Lists A or B should continue to be made to the Export Licence Department, 4, Central Buildings, Westminster, S.W. 1, but no certificates from the Danish Associations need be produced.

Annual Outing.—The employés of the St. Pancras Borough Council Electricity and Public Lighting Departments held their 25th (Victory) annual outing and dinner on Saturday, June 14th, when Southend was visited. Over 100 sat down to dinner at Garon's Maisonette Café, in the High Street, Southend. The Mayor of St. Pancras (Mr. G. F. Parsons) presided, and he was supported by the following:—Alderman Chas. Williams, Councillors T. A. Collins, H. H. Mayes, D. Edwards, H. Flight, Mr. C. H. F. Barrett (town clerk), Mr. S. W. Baynes (chief electrical engineer), Mr. A. E. Pycraft (chief clerk), Messrs. W. A. Brown, Albert Blanks, and H. E. Ellis. A most enjoyable day was spent. The arrangements were in the hands of Messrs. W. Layton and W. G. Sutton.

Motor Lorries for Sale.—1,500 unused motor lorries (3 to 4 tons) are being placed on the market as surplus war stock, and they will be sold by private treaty by direction of the Disposal Board of the Ministry of Munitions. The Controller of the Mechanical Transport Department, 1, Grosvenor Place, S.W., will give particulars.

French Import Restrictions Withdrawn.—The *Board of Trade Journal* for June 19th contains preliminary particulars of the French Presidential Decrees published in the *Journal Officiel*, providing for the abolition of import restrictions on a large number of goods imported into France or Algeria, and the increase, by means of *ad valorem* surtaxes, of the rates of Customs duty upon goods imported into those countries. Copies of the decrees in question are on view at the offices of the Department of Overseas Trade, 73, Basinghall Street, E.C. 2, and the full translation will be published in the *Journal* for June 26th.

Sale of Connolly's.—At the Thatched House Hotel, Manchester, on Tuesday, last week, Messrs. Edward Rushton, Son and Kenyon offered for sale by public auction in one lot, as a going concern, the freehold land and premises known as the Blackley Vale Mill, Blackley, near Manchester, together with the machinery and plant for the manufacture of insulated wire and cable, and the motive power plant, utensils, and fixtures therein, together with the goodwill of the business, and the benefit and obligation of pending orders and contracts. The price realised was £35,000. The stock-in-trade and new stores are to be taken over by the purchaser at a valuation to be made by the auctioneers on behalf of both parties.

Patent Restoration.—Application for restoration of Patent No. 28,953 of 1912, granted to P. Marino for "Salicylate electrolytes for use in the electrolytic deposition of metals or metallic alloys," has been made by British Electro-Chemists, Ltd.

The Industrial League.—The June issue of the *Industrial League Journal* contains articles ranging from "International Labour Conditions," by Mr. G. J. Wardle, C.H., M.P. (Parliamentary Secretary, Ministry of Labour); to one on "Workers and Costing," by Lieut. C. Lathan; also a verbatim report of a "Workmen and Shop Stewards' Meeting" addressed by the Right Hon. J. R. Clynes, M.P., and the Right Hon. G. H. Roberts, M.P. An announcement appears of the association of the Industrial League with the Civic Federation of America, an organisation that has very similar objects.

Belgian Agencies Wanted.—The *Board of Trade Journal* states (Reference No. 1,173) that a consulting electrical engineer in Brussels desires to obtain agencies from British manufacturers of electrical material and accessories for central generating stations.

The French Mines: Restoration Schemes.—The *Kölnische Zeitung* in referring to the statement made by Foch to the German Armistice Commission to the effect that the French mines had been flooded and destroyed by Germany according to a definite plan, which must be handed to the Allies in order to facilitate an examination of the shafts, says that the German Government has replied that no such plan exists. The mines were flooded or blown up from time to time as military necessity arose, and the only directions available are some odd notes comprehensible only to an expert familiar with the localties. The Government has offered to send such an expert to meet the French mining authorities and explain the notes. This offer has been accepted.

Trade Risks with Russia: Government Insurance Scheme.—Arrangements have now been made whereby the Board of Trade War Risks Insurance Office, 53, Cornhill, E.C., will be able to give facilities for the insurance of the inland risks upon

(*a*) British goods imported into Russia, and

(*b*) Goods bought by British firms for export from Russia.

The insurance will cover the goods against loss or damage arising from war risks, riots, civil commotions and other risks usually included in an ordinary Lloyd's policy. Full particulars and rates of premium—which will vary according to the localities concerned—can be obtained on personal application to the War Risks Insurance Office, which should be supplied with precise details of the nature and destination, or, in the case of exports, place of purchase of the goods to be insured. Policies will, in the first place, only be issued for the area in South-Eastern Russia and the Northern Caucasus, including the ports of Taganrog, Rostov-on-Don, Novorossisk and Tuapse. Facilities for marine insurance will also be given in cases where this cannot be obtained through the ordinary channels.

It is hoped that one of the more important effects of this provision of insurance facilities will be to enable banks to give advances in the ordinary way of business to traders (1) in respect of shipments from the United Kingdom to Russia, and (2) in respect of goods lying in Russia available for export.

Some of the leading banks are giving special consideration to the question of Russian trade development, and among others the British Trade Corporation, Lloyds Bank, the London County and Westminster and Parr's Bank and the National Provincial and Union Bank of England have intimated that they are prepared to consider applications for advances against goods sent to Russia and insured as above. The banks are also considering the opening up of business in different parts of Russia, and it is hoped that this may lead to methods being found by which the exchange of British and Russian goods will be facilitated.

Whitley Councils for Government Establishments.—There is published as a supplement to the *Labour Gazette* for June a full copy of the Draft Constitutions of the following Whitley Councils and Committees for Government Industrial Establishments:—(1) Departmental Joint Council; (2) Trade Joint Council; (3) Shop, Department, Works or Yard, and Trade Committees.

Female Labour.—Another stage in Burnley engineering dispute regarding employment of female labour has been reached. Under protest, Messrs. Simpson Bros., of Hapton, who are not members of the Employers' Federation, have given the women workers notice to cease electrical work. Should investigations prove satisfactory, the women will be reinstated.

The Electrical Wholesalers' Federation, Ltd.—At the last meeting of the Main Committee of this Federation, Mr. W. Donovan, of Messrs. Donovan & Co., Birmingham, was elected chairman of Committee for the ensuing year, and Mr. H. H. Berry, of Messrs. Berry's Electrics, Ltd., vice-chairman. Mr. A. G. Beaver, of the Sun Electrical Co., Ltd., was re-elected honorary secretary. A cordial vote of thanks was accorded the outgoing chairman, Mr. R. W. Smith, for his able services during the past three years.

Copper Mines Shut Down.—The *Times* stated last week that the Mount Morgan Mines, near Brisbane, had closed down, rendering 1,500 workers idle.

The Industrial Tour of Brazilian Delegates.—On Monday last the Brazilian Commercial Delegates who are on a visit to this country, began, in company with a representative delegation from the Federation of British Industries, the business side of their programme. On that day the refrigerating machinery works of Messrs. J. & E. Hall were visited; Tuesday and Wednesday were devoted to visits to explosives works and docks in London; yesterday they went to the electric lamp works of the General Electric Co., Ltd. To-day there is a Federation lunch at the Savoy, and to-night a Government dinner at the Carlton Hotel. To-morrow there is to be a trip by road to Windsor, followed by the journey on Sunday to Birmingham, which will be their centre for five days, during which the Wolseley Motor Works, and Millward's needle works at Redditch, Willans & Robinson works at Rugby, Kynoch's, and Alldays & Onions's works at Birmingham, will be visited. On Friday, July 4th, the party will proceed to Glasgow, where they will see David Colville's, Beardmore's and Nobel's works. On July 12th they will proceed to Edinburgh and see the North British rubber factories. On Tuesday, July 15th, they will be at Armstrong, Whitworth's at Newcastle; on the following day at the Parsons marine turbine and North-Eastern Marine Engineering works. Darlington receives them next at various works. The delegates will reach Liverpool in time to visit the British Insulated and Helsby Cables works on July 21st. While at Manchester they will see the Armstrong, Whitworth, British Westinghouse, Crossley Motor, and other works, also the Manchester Ship Canal. On July 28th one section of the party will proceed to Sheffield, and the other to Bradford. Hadfield's, Firth's, and many other factories, are in the programme. Leicester next receives attention, and thereafter movements are dependent upon the Government decisions in regard to Peace celebrations. After these celebrations the tour will be resumed on August 10th, and Bristol and Swansea will exhaust the intentions, if not the energies, of the party. The official programme is, as in the case of a previous tour carried through by the F.B.I., prepared in excellent style, and we have no doubt that the efforts of the Federation will bring in due course ample repayment in the shape of Brazilian business as the result of the very effective demonstration that will be given of British industrial capacity.

Condensing Plant.—Recent orders for Mirrlees condensing equipments, received by the MIRRLEES, WATSON CO., LTD., of Glasgow, include seven multiple jet condensing plants with combined rotary and water extracting pumps (Mirrlees, Leblanc system). One of these is for the Steel Co. of Scotland, Hallside Works, to work with Parsons steam turbines, the steam duty being 45,000 lb. of steam per hour. Another is for the Huddersfield Corporation, St. Andrew's Road power station, the steam duty being 72,000 lb. of steam per hour. The Mirrlees multijector air pump is being adopted by large and important power stations. A Mirrlees surface condensing plant for a steam duty of 161,500 lb. of steam per hour has been ordered for the Glasgow Corporation, Dalmarnock power station, and this plant includes eight multijector air pumps (Mirrlees, Leblanc system). The multijectors are arranged in two banks, each bank of four being connected in parallel, so that one or more ejectors in either bank may be operated to deal with the air leakage, thus providing flexible and most economical arrangement.

Scientific Business Management.—This is the title of No. 28 of the series of useful grey pamphlets (2d.), issued by the Ministry of Reconstruction.

Liquidations.—CONNOLLY BROS., LTD., Blackley Vale.—A petition for the winding up of this company has been presented by Messrs. T. Bolton & Sons, Ltd., and will be heard on July 1st.

WESTINGHOUSE METAL-FILAMENT LAMP CO., LTD.—Winding up voluntarily. Liquidator, Captain M. L. Crandon Gill. Meeting of creditors June 30th, at 2, Norfolk Street, Strand, W.C.

"THE WOODVILLE GARAGE," automobile, electrical and general engineers, Catherine Street, Cardiff.—Mr. E. F. Tompkins and W. Latta have dissolved partnership. Mr. W. Latta will attend to debts.

Catalogues and Lists.—MR. F. J. HASTINGS, 57, Albert Road, Aston, Birmingham.—Leaflet giving prices (June) of electric lamps, motors and supplies for theatres and kinemas.

THE ELECTRICAL ALLOY CO., Morristown, New Jersey, U.S.A.—Illustrated circular respecting their nickel and nickel alloy wire and strips.

Plant for Sale.—The Disposal Board of the Ministry of Munitions invites tenders for the purchase of machine tools, plant, office and canteen furniture at the "Edith Cavell" projective factory, Glasgow. See our advertisement pages this week.

Book Notices.—"Year Book of Wireless Telegraphy and Telephony" for 1919. Pp. cxvii + 1,160 and map. London: Wireless Press. Price 7s. 6d.

"*Journal* of the Institution of Electrical Engineers." Vol. LVII, No. 282. May, 1919.—This issue contains the following papers:—"The Navigational Magnetic Compass," by Mr. M. B. Field; "Electric Power Supply During the Great War" (Part I), by Mr. A. H. Gridley and Mr. A. H. Human; and "The Susceptibility of Feebly Magnetic Materials," by Prof. E. Wilson.

"Science Abstracts" (A and B). Vol. XXII, Part 5. No. 257. May 31st, 1919. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each post free.

We have received a copy of *Industry in Parliament* (No. 3), a monthly journal recording the operations of the British Commonwealth Union. A considerable number of additional firms have been elected as members.

Trade Announcements.—Owing to rapid growth of business, the ELECTRICAL ACCESSORIES MANUFACTURING CO. have taken larger premises, and their address as from July 14th will be Progress Works, Crossland Street, Holbeck, Leeds.

MR. C. ORGEL, wholesale electrical dealer, has taken larger premises at 111, Great Eastern Street, London, E.C. 2.

MESSRS. F. & A. PARKINSON, LTD., of Guiseley, Leeds, announce that their London office has now been changed from Victoria Street to 34, Broadway, Westminster, London, S.W. 1. Telegraphic address and telephone number unchanged: "Octopede, Vic., London"; "Victoria 3373."

MESSRS. CLOUGH, SMITH & CO., LTD., have removed to 36, Victoria Street, London, S.W. 1, where all communications should be sent. Telephone No.: "Victoria 7937"; telegrams: "Clufmit," Vic., London."

MR. H. SLOOG announces the removal of his offices, as from June 24th, to 45, Great Marlborough Street, London, W 1. Telephone No: "Regent 2460."

Mr. R. S. GOODBURN, electrical engineer, has reopened his works at Clarendon Road, Broadstairs.

With reference to their recent change of address to temporary offices at 69, Victoria Street, pending release of premises then in Government occupation, MESSRS. POOLEY & AUSTIN state that the latter premises have been released earlier than anticipated, and on 24th inst. they moved into their new permanent address at 34, Broadway, Westminster, S.W. 1. Telephone and telegraphic address unaltered.

MESSRS. I. FRANKENBURG & SONS, LTD., of Salford, have changed the address of their London office from 25, Victoria Street, to 34, Broadway, Westminster, S.W. 1. Telegraphic address and telephone number unchanged.

TITAN ELECTRICAL CO.—The company is moving into larger premises and establishing a showroom at 20, High Holborn, W.C. 1, where electrical fittings will be displayed. Telephone, Holborn 4687.

THE BRITISH ELECTRICAL AND MANUFACTURING CO., of Newcastle-on-Tyne, have opened an office at 102, Union Street, Glasgow, under the charge of Mr. W. A. B. Ames. They have also re-opened their branch at Athenæum Street, Sunderland, with a comprehensive stock, under the charge of Mr. J. A. Woods.

The Aerial Derby.—In the "Aerial Derby" held at Hendon on Saturday last—"the fastest Aerial Derby on record"—the engines on the machines winning the first and second prizes were equipped with B.T.H. magnetos, the winners being Capt. Gathergood, flying an Airco machine with Napier engine, and Lt. Robert Nisbet, flying a Martynside biplane with Rolls-Royce "Falcon" engine.

Non-Ferrous Metal Industry Act.—The *London Gazette* for June 24th contains a list of further additions to the licences granted under this Act.

LIGHTING AND POWER NOTES.

Ayrshire.—E.L. SCHEME.—Kilwinning T.C. is to ascertain from the Kilmarnock Corporation the terms and conditions for lighting the streets and houses in the town. It is understood that energy is being delivered to Largs, while the village of Dundonald is also supplied. The County Council has granted an application for a branch cable from Ardrossan to Dalry.

Bolton.—FIRE.—Considerable inconvenience and damage was occasioned by a fire, last week, at the Corporation electricity works. An old water-cooler adjoining the works was being dismantled when the outbreak occurred; the cause is unknown. Flying embers set fire to the roof of the works. Damage was confined to the engine-house, but the converters had to be stopped. Cars continued running on three routes, current being obtained from Bury and the South Lancashire system, but the full service

was not available for the rest of the day, though there was a sufficient supply for lighting in the evening. For two hours, pending the connecting up with the other stations, Bolton was without its accustomed supply of electricity.

Brighton.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking for the year ended March 31st last, show total revenue, £144,439, against £119,003; expenditure £100,358, against £76,025; gross profit, £44,080, against £42,977. After deducting sinking fund, interest and other charges, the net profit was £3,112, which has been carried forward. During the year the total units sold amounted to 10,144,392, against 10,242,007; the average price of coal per unit sold was 1·11d., against 0·99d. Total works cost per unit sold, 1·67d., against 1·40d. 28,442 tons of coal were consumed during the year, the average price paid being 38s. 5½d. per ton, and the consumption per unit sold 5·4 lb., equivalent to an increase of 1·55 per unit sold, 5,000 tons consumed, and an extra £30,000 expenditure over pre-war conditions. The department has now 4,588 H.P. of motors connected, and numerous applications have been received for radiators, cookers, heaters, and other accessories, the original No. 3 1,800-KW. turbo-alternator has been scrapped, and a new 4,000-KW. turbo-alternator is due for delivery in the autumn. The total average price obtained per unit was 2·96d., against 2·63d.

Colne.—YEAR'S WORKING.—The report on the electricity department for the year ended March 31st last, shows that practically no expenditure on capital account was incurred during the year. Capital expenditure was £55,873, and that repaid to date £30,584. The income, £13,242, was the highest reached by the department, being a net increase over the previous year of £707. Cost of generation and distribution was £9,461, against £8,322; gross profit, £3,781, against £4,213; interest and income tax, £1,897; and principal repaid, £2,460. After providing for interest and repayment of principal, there was a loss of £576, against a profit of £5 last year. 1,446,606 B. of T. units were generated, and 1,209,903 were sold during the year. The increase in units supplied for lighting and power was 114,165; traction, 10,660; public lighting, 5,375; or a total increase in units sold of 130,200. The plant capacity was 1,030 KW., and the maximum load, 586 KW., with a load-factor of 23·4 per cent.

Crowle.—E.L. SCHEME.—The U.D.C. has declined to adopt an E.L. scheme submitted by Mr. Wroot, who suggested the purchase from the Admiralty of two generating engines which had been used for searchlights. The estimated cost of the scheme is £5,000.

Doncaster.—PROPOSED NEW PLANT.—It is proposed to put down £40,000 worth of new plant at the electricity works, and application for borrowing powers to this extent is to be made. It is proposed to add a 1,500-KW. turbo-alternator and an additional large water-tube boiler, bringing the capacity of the works up to 4,300 KW.

Dalry.—OVERHEAD TRANSMISSION.—Permission has been granted to the Kilmarnock T.C. to carry an overhead main for supplying electricity to Dalry from the existing cable at Ardrossan.

Denny.—MAINS EXTENSIONS CANCELLED.—On account of the cost (£720) the T.C. has decided not to extend the E.L. mains to Anchor Burn, Dunipace.

Dundee.—NEW PLANT.—The Electricity Committee has agreed to the engineer obtaining machinery for the proposed extension of the electricity station, at a cost of £136,019. The engineer, with the view of saving time, has obtained prices from contractors who have done similar work for the Corporation. Two 5,000-KW. Willans turbo-alternators will cost £69,659, and four large B. & W. water-tube boilers, £66,360. The prices do not allow for increases in labour or material. They would be only losing time and gaining nothing by advertising for tenders.

LOAN SANCTION.—The Secretary for Scotland has sanctioned the borrowing of £250,000 for the purpose of capital works, raising the total sum authorised to be borrowed to £759,000, on condition that the department set aside annually a sinking fund of not less than 4 per cent. on the amount borrowed.

Durham.—PRICE INCREASE.—The County of Durham E.P. Distribution Co., Ltd., is to further increase the price of electricity, as from the expiration of the June quarter, by 30 per cent. for lighting and 10 per cent. for heating.

Eccles.—BULK SUPPLY.—The Corporation is taking a bulk supply of electricity from the Lancashire E.P. Co.

Edinburgh.—PRICE INCREASE.—The price of stair lighting is to be raised from 19s. 3d. to an average of 22s. 6d. per lamp.

Ewell.—E.L. SCHEME.—The P.C. has asked the South Metropolitan Electricity Co. when it is likely to have electricity supplied to the parish, and has requested the R.D.C. to press the matter forward.

Grimsby.—YEAR'S WORKING.—The electricity undertaking shows a deficiency of £2,642 on the past year's working.

Heywood.—LOAN SANCTION.—The Corporation has received the sanction of the L.G.B. to borrow £4,938 and £5,350 for the purposes of the electricity undertaking.

Kirkby-in-Ashfield.—WATERWORKS ELECTRIFICATION.—The Butterley Co. is about to electrify its waterworks, and will install conductors of sufficient capacity to supply energy to the waterworks of the U.D.C.

Llandyssal (Cardiganshire).—HYDRO-ELECTRIC SCHEME.—Steps are being taken to provide a supply of electricity for the town. It is proposed to utilise water power.

London.—POPLAR.—The report on the electricity undertaking for the year ended March 31st shows that units sold increased from 20,505,024 to 21,526,200; net income increased by £25,985, and working expenditure by £20,133; gross profits increased by £5,851. The net profit totalled £8,984, and, after providing for first charges on net profits, a sum of £6,215 is available for distribution under the Council's bonus scheme; of this £2,486 is transferred to general account. Bonus to staff, £1,221 (being 20 per cent. up to £6,000 and 10 per cent. over), and the balance (£2,508) is to go to reduction of assets.

Lytham.—PROPOSED LOAN.—The D.C. is to apply to the L.G.B. for sanction to borrow £35,500 for electric lighting purposes.

Manchester.—SUB-STATION WRECKED.—As the result of the collapse of a mill chimney which was being demolished at Ancoats last week, an electric sub-station was wrecked. It supplied a number of firms in the district, and, as a result, these premises were temporarily closed for a few days.

Motherwell.—BULK SUPPLY.—The T.C. has accepted terms for a supply of electricity from the Clyde Valley E.P. Co.

Penicuik.—WORKS ELECTRIFICATION.—Messrs. Tait and Co. are introducing electrical power into their works, and the plans for the necessary alterations have been adopted by the T.C.

Portrush.—NEW GENERATING STATION.—The U.D.C. has agreed to purchase for £1,800 property at Portseadden Bay, at a yearly rental of £10, as a site for an electrical generating station.

Rathmines.—PRICE REVISION.—The U.D.C. has fixed the minimum charge for a supply of electrical energy at 10s. 6d. per quarter for each consumer, this charge to come into operation from September 1st next.

Reigate.—PRICE REVISION.—The T.C. has applied to the B. of T. for consent to increase the price of energy by 1d. beyond the statutory maximum charge of 8d., as from July 1st next.

Rochdale.—LOAN SANCTION.—The L.G.B. has sanctioned the borrowing of £3,500 overspent on cables, and for various small amounts for new work.

The Corporation Electricity Committee has approved the acceptance of tenders for the supply of cables, switchgear, &c., for the extensions to the D.R. Cotton Mills, amounting in all to about £40,000.

Selkirk.—STREET LIGHTING.—The T.C. has deferred the introduction of street lamp controllers until the comparative cost of gas and electric lighting has been ascertained.

Shanklin (I. of W.).—PUBLIC LIGHTING.—The E.L. Co. has informed the U.D.C. that if the whole of the lighting is undertaken the cost per lamp will be about £2 2s. per annum.

Southmolton.—EXPERT ADVICE.—Mr. Stuart, of Ilfracombe, is to advise on the proposed E.L. scheme for the borough.

Southport.—LOAN SANCTION.—The L.G.B. has sanctioned the application of the Corporation for permission to borrow £130,000 for the new electrical plant and mains extensions. The department has 200 applications for energy, which it cannot grant as the present plant is overloaded. It is estimated that the new plant will effect a saving in fuel of £7,000 a year (£8,400 if the price of coal advances by 4s. 6d. per ton), and it is proposed to carry out the work at once, so as to be ready for next winter.

Sunderland.—PRICE INCREASE.—Charges for electricity supply are to be increased as follows:—In place of the present power rate, there is substituted a rental of £4 per K.V.A., plus 4d. per unit, plus an increment of ·0054d. for each 3d. rise in the cost of coal above the standard price of 8s. 6d. per ton. The present increases in the rates for lighting, domestic use, cooking, and heating are to be advanced to 33⅓ per cent. The effect of the new charges is to bring the increase over pre-war rates up to 53 per cent. in the case of power and 56 per cent. in the case of general supplies. The average price received for supplies works out at 1·09d. per unit.

Tenterden.—BULK SUPPLY.—The T.C. has decided to support the scheme of the Hastings T.C. to supply electricity in bulk to the borough.

Thornton.—TIME EXTENSION.—Application is to be made for the electric lighting order to be extended for a further 12 months. Negotiations are in progress for the amalgamation of the district with the neighbouring county borough of Blackpool.

Tonbridge.—LOAN APPLICATION.—The T.C. has applied for a loan of £2,500 for mains extensions.

Torquay.—PRICE INCREASE.—The T.C. has decided to increase the price of electricity for lighting by ½d. per unit, and heating and power by ¼d. per unit, from the Midsummer meter readings. Meter rentals have been fixed as under:—Up to 10 and including 25-ampere capacity, 1s. 9d. per quarter; meters of larger capacity, 2s. 9d.

Tuam.—E.L. Scheme.—The gas company has notified the Town Board that it intends applying for a prov. order for power to supply electricity for all purposes in Tuam and district. The Tuam Electric Light and Power Co., recently formed, is also applying for a prov. order for the same purpose, and the former application is to be opposed.

Tunbridge Wells.—Restricted Supply.—Until new machinery has been installed, no further application for connections for lighting or heating can be entertained, except at the discretion of the Committee.

Watford.—Loan Sanction.—The U.D.C. has received sanction to loans amounting to £20,540 for electricity purposes.

Warminster.—E.L. Scheme.—The U.D.C. has been informed that there is no probability of the town being lit by electricity next October as had been hoped, with a supply from a military power station.

Weymouth.—Price Revision.—The price of electricity has been increased as under from July 1st:—Lighting, from 7d. to 8d. per unit, with discount; power, 2½d. net, instead of 3d. for the first 20 units per quarter, and 2d. beyond; fixed price lighting advanced by 10 per cent.

Loan Application.—A loan of £2,500 for services has been applied for.

Wolverhampton.—Mains Extensions.—The electric mains are to be extended in various districts of the borough and in Buckbury, at an estimated cost of £6,379.

TRAMWAY AND RAILWAY NOTES.

Accrington.—Track Subsidence.—Part of the tramway track in Blackburn Road has been sinking, on account of an old sewer, and the cars incline so much that they are in danger of touching when passing each other. Extensive repairs are now proceeding.

Ardsley.—Linking-up.—The U.D.C. has decided to support a scheme for linking-up the Leeds and Dewsbury tramways along the main road passing through the Council's area.

Argentina.—Strike.—The tramway services at Buenos Aires have been resumed, and the situation has become more normal.

Birmingham.—Electric Vehicles.—The city's order for electric dust-collecting vans was given to Messrs. Edison Accumulators, Ltd.

Brazil.—Railway Electrification.—According to the *Engineer*, proposals are said to be before the Brazilian Government for the electrification of the Estrada de Ferro Central do Brazil—the Central of Brazil—between Rio de Janeiro and Barra do Pirahy, and between Santa Cruz and Piracamby, by a group of English and Italian financiers.

Burnley.—Proposed Omnibus Service.—The Corporation proposes to ask for power to run a motor-'bus service between its tramway terminus and Rawtenstall tramway terminus at Loveclough.

Chile.—Railway Electrification.—Of the loan recently authorised for carrying out railway improvements $25,000,000 has been assigned for the electrification of the first railway zone, comprising Valparaiso, Los Andes, Santiago.

Continental.—Switzerland.—The introduction of a Bill providing for Federal, Cantonal, and Communal subventions for the electrification of private railways has been approved by the Swiss State Council.

Doncaster.—Loan Application.—The T.C. has applied for a loan of £5,500 for a new tramcar shed and for the inside track and pits.

Edinburgh.—There is a doubt as to whether the Corporation undertaking will be able to furnish electricity for the working of the first section of the electrified Corporation tramways by the winter of 1920. Every effort is being made to push on the work of the new power station at Portobello.

Glasgow.—Year's Working.—The total revenue of the Corporation tramways for the past year was £1,531,320, an increase of £118,685. Expenditure showed correspondingly larger increase, and the balance carried to net revenue account was £281,331, against £368,452 for the previous year. The total surplus to be handed to the City Common-Good Fund is £14,772, against £177,552.

India.—Year's Working.—The net revenue of the Calcutta Tramways Co. for the year 1918 was £151,100. The reserve for depreciation received £25,000, making the total £120,500, and £2,000 was set aside as a reserve for investment depreciation, increasing that account to £4,000. The amount carried forward was increased from £8,400 to £28,600.

London.—L.C.C.—The financial burdens of the L.C.C. tramways were further explained to the Select Committee on London Traffic last week by Sir H. Haward, Comptroller of the Council, who said that the estimated deficiency for the year ending March next, was £158,913. The only way to have kept up the renewals fund would have been to raise the fares in 1912-13, which would have been a very dubious step to take at that time, when there was severe omnibus competition. The likelihood of fares having to be further increased, depended on competition and on expenses. The latter were estimated to rise much further, and he saw no prospect of fares being reduced. Mr. A. L. C. Fell, general manager L.C.C. tramways, said the tramways should be permitted a higher speed, and traffic should be regulated as in New York, by automatic signalling posts at crossings. Mr. Fell denied that the bulk of the passengers were paying double fares, and said there was no intention of having trick sections; over 50 per cent. of the traffic consisted of penny passengers. Omnibus companies ought to be compelled to run workmen's services. The price of new cars was now three times the pre-war cost. Probably in the future a smaller car would be introduced, either with a trailer or a coupled car. Uniformity between cars and trains was difficult on account of the difference in speeds. The Council would be satisfied with a profit of 4d. per car-mile, and he was in favour of the financial burden of the roads being equalised between transport undertakings. He would do away with tramway deadends, and develop the linking up of lines, and he suggested that omnibuses should not operate where the traffic justified the running of tramways. The most congested terminus was Blackfriars, but the pressure there was now somewhat relaxed because the new fares were equalised both ways *via* Blackfriars or Westminster. Victoria was a difficult place to deal with, and until a loop line was obtained the present system was the best. If the Victoria terminus was linked up with Harrow Road, *via* Hyde Park and Edgware Road, it would be a great advantage. Victoria Street was wide enough for a double track, and Birdcage Walk would be an alternative, but less useful route. During the war the Council sold 59 cars of obsolete type to other authorities at the request of the Ministry of Munitions, but the Council had no power to run those cars.

Improved Tube Service.—The Metropolitan Railway Co. is making various improvements throughout its system, giving a more frequent and rapid service. Later trains are also to be run.

From Saturday last 12 stations on the underground railways which have been temporarily closed on Sundays will remain open all day. Also 27 stations, which have been temporarily closed earlier at night, will remain open until the time of the last advertised trains.

L.U.T. Track Repairs.—The relaying of the whole of the L.U.T. tramway track in the Chiswick High Road has commenced. Traffic is being maintained over one line.

TELEGRAPH AND TELEPHONE NOTES.

Automatic Telephones.—A regrettable error crept into our note under this heading last week. The new Huddersfield telephone exchange is of the central-battery manual type—not automatic—the full equipment for which was supplied and erected by the Peel-Conner Telephone Co., Ltd.

Cable Delays.—Further representations are, we understand, to be made immediately by merchants to the authorities on the subject of the serious cable delays. Since much business is normally conducted on a c.i.f. basis, business under present conditions of delay is often quite impracticable. The continued refusal of the authorities to permit the use of private codes is undoubtedly responsible for much of the delay.—*The Times.*

It is officially announced that, owing to an interruption of the cable between the Azores and St. Vincent, on May 22nd, the West African full-rate traffic was delayed from one to three days, and that, in the case of deferred telegrams at half rates, the delay was as long as eight or nine days. On June 10th the cable was restored.

From New Zealand comes the news that a deputation of the Associated Chambers of Commerce waited on the P.M.G. and protested against the delays on commercial cables. The Minister held out no hope of an immediate improvement.

Constantinople Telephone System.—The financial Press states that the general manager of the Constantinople Telephone Co., now on a visit to London, reports that the plant was taken over finally from the Turkish authorities as from April 1st last, and the service is now being conducted by the company.

New Marconi Invention.—At the general meeting of the Marconi International Marine Communication Co., held last week, Mr. G. C. Isaacs stated that the number of stations installed and worked by the company at the end of the year was 2,549, and now stood at 2,638. They had every reason to hope that telegraph stations on board ships would be more freely used in the future than they were in the past. They thought it probable, too, that an additional source of revenue to the company would arise from the more general use on board ships of direction-finding apparatus. To an even greater extent it was thought that the latest invention of Senator Marconi would be adopted on board ships. This new discovery provided means whereby a ship in the densest fog might discern the approach of another ship, provided that that ship be also fitted with the apparatus, and, at the same time, giving an approximate idea of the distance of the approaching ship. At present commercial shape was being given to this new apparatus, and its value on board ship would be shortly demonstrated.

P.O. War Work.—According to Mr. Pike Pease, the telegraph business at the front was magnificently organised, and at headquarters alone over 7,000 telegrams have been dealt with in one day. The P.O. supplied 40,000 miles of cable for use in the trenches, and 200,000 miles of overhead wire, the insulators used numbering five millions.

Secret Wireless Stations.—During the examination of spies arrested by the Finns, it was found that the "Reds" had a wireless station at Helsingfors, which it is hoped will shortly be discovered. Further, it is probable, says the *Times*, that a similar station exists in England.

United States.—The House of Representatives has adopted the Bill passed by the Senate providing for the return of the telegraphs and telephones to private control.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

OPEN.

Australia.—SYDNEY.—August 27th. N.S.W. Railways and Tramways Department. Three-phase induction motors. Chief Electrical Engineer, 61, Hunter Street, Sydney.—*Tenders.*

Bedford.—July 14th. Electricity Committee. One 1,500-KW. 1-phase turbo-alternator and condensing plant, boilers, superheaters, mechanical stokers and induced draught plant, E.H.T. switchgear, water softener, feed-water heater and storage tanks, water-measuring apparatus, feed pumps. (June 20th.)

July 21st. Electricity Committee. Buildings, electric motors, &c., coal conveyor, runaway and chutes. (See this issue.)

Belfast.—June 30th. Harbour Commissioners. Three or five electric travelling gantry cranes. Mr. T. S. Gilbert, Harbour Engineer, Harbour Office, Belfast.

Birkenhead.—July 28th. B. of G. Installation of internal telephones. (June 6th.)

Colne.—July 4th. Electricity Department. Supply, drawing-in and jointing of approximately 2,200 yd. ·05 sq. in., 3,300-volt, 3-core cable. (June 20th.)

Darlington.—July 11th. Electricity Department. Rotary converter, cooling tower, water-tube boiler, economiser, and induced draught fan. (June 20th.)

Gravesend.—July 12th. Electricity Department. One 2,000-KW. turbine with 6,000/6,600-volt 3-phase alternator, condenser with motor-driven air and circulating pumps. (June 20th.)

Kirkcaldy.—June 30th. T.C. One 7-B.H.P. electric motor and equipment for the organ at the Adam Smith Halls. Specification from the Burgh Electrical Engineer, Electricity Works.

Paris.—July 10th. Administration des Postes et Télégraphes. Supply of multiple commutator switchboards. Particulars from Direction de l'Exploitation Téléphonique, 4, Bureau, 103, Rue de Grenelle, Paris.

Portsmouth.—July 3rd. Electricity Department. Water-tube boiler, steam capacity 20,000 lb. per hour (June 20th.)

Salford.—June 30th. B. of G. Repairs to telephone apparatus at Eccles New Road Institution. Mr. E. H. Inchley, Clerk, Poor Law Offices, Eccles New Road.

July 7th. Electricity Department. Steel cinder bunker at the power station, Frederick Road, Pendleton. Borough Electrical Engineer.

Tasmania.—LAUNCESTON.—July 28th. City Council. Sub-station equipment, battery, reversible booster, switchgear, &c. City Electrical Engineer.

West Ham.—July 1st. T.C. 20 single-truck electric tramcar bodies, with roof covers. Mr. L. Slattery, General Manager, Greengate Street, Plaistow, E. 13.

CLOSED.

Australia.—P.M.G.'s Department, Queensland :—
1,000 telephones, magneto wall pattern, £4,650.—J. Paton & Co.—*Tenders.*

Burnley.—Health Committee. Edison electric 3½-ton vehicle, with tipping body, &c., £1,814.

Coventry.—The City Council has been recommended to accept tenders amounting to £10,908, for five new tramcars.

Glasgow.—Tramways Committee. Recommended :—
Car motor equipment.—British Westinghouse E. & M. Co., Ltd.
Car motor controllers.—British Thomson-Houston Co., Ltd.
Armature coils.—Manchester Armature Repair Co.
Scrap brake blocks.—Miller & Co.
Special track work :—

Edgar Allan & Co. (delivery 10 weeks)		£5,655
Hadfields, Ltd. (3 to 4 months)		5,624
U.S. Steel Products Co., Ltd. (Loraine Steel Co.) (8 to 10 weeks; 6 to 9 weeks if order cabled) ..	(recom.) ..	5,184

Government Contracts.—The following Government contracts were placed during May, 1919 :—

CROWN AGENTS FOR THE COLONIES.
Electric turret clock.—Gent & Co., Ltd.
W.P. insulators.—Bullers, Ltd.

WAR OFFICE.
Motor converters.—Bruce Peebles, Ltd.
Transformers.—Foster Engineering Co., Ltd.

INDIA OFFICE—STORE DEPARTMENT.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
Cable.—Macintosh Cable Co., Ltd.; Siemens Bros. & Co., Ltd.; General Electric Co., Ltd.
Cells.—J. C. Fuller & Son, Ltd.; D.P. Battery Co., Ltd.
Copper wire.—F. Smith & Co., Ltd.
Crucibles.—Morgan Crucible Co., Ltd.
Train lighting materials.—J. Stone & Co.

POST OFFICE.
Telegraph apparatus.—Automatic Telephone Manufacturing Co., Ltd.
Telephone apparatus.—British L.M. Ericsson Manufacturing Co., Ltd.; India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.; London Electric Wire Co. & Smiths, Ltd.; Park Royal Engineering Works, Ltd.
Battery boxes.—W. D. Tucker & Sons, Ltd.
Telegraph & telephone cable.—British Insulated & Helsby Cables, Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; Union Cable Co., Ltd.
Insulators.—Taylor, Tunnicliffe & Co.
Sheet & strip lead.—Grey & Martin, Ltd.
Troughing & cover.—Doulton & Co., Ltd.
Troughing.—A. Bruce & Co.; Burt, Boulton & Hayward.
Bronze insulated wire.—Siemens Bros. & Co., Ltd.
Soft strand copper wire.—T. Bolton & Sons.
G.I. strand wire.—Rylands Bros., Ltd.; Whitecross Co., Ltd.
V.I.R. wire.—W. Geipel & Co.
Laying conduits.—Kingston-Portsmouth Road: Grounds & Newton; London-Stanmore corner (manholes): J. Mowlem & Co., Ltd.
Manufacturing, supplying, drawing-in and jointing cables.—Manchester-Rochdale, W. T. Glover & Co., Ltd.; Leeds-Wakefield, Johnson & Phillips, Ltd.
Extension of Telephone Exchange equipment at Derby.—Western Electric Co., Ltd.
Supplying and erection of pick-up carrier at Manchester Head Post Office.—Lamson Pneumatic Tube Co.
Overhaul & repair of recovered submarine cables.—India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.
Overhaul and repair of H.M. T.S. "Monarch."—R. & H. Green & Lilley Weir.

H.M. OFFICE OF WORKS.
Engineering works.—Electric Wiring Kew Insurance Offices: Lund Bros. & Co.

PUBLIC WORKS, IRELAND.
Electrical works & supplies, Belfast district.—A. Stevenson.

Hull.—Corporation. Telephones Committee. New district automatic exchange. Tender of £19,800 accepted.

Preston.—The Corporation Cleansing Committee recommends the acceptance of a tender for two electric vehicles for that department, at a cost of £2,664.

Richmond-on-Tees.—T.C. :—
E.L. installation at the public baths.—Beard & Co., £57 10s.
Two electric dust vans :—

General Vehicle Co., Ltd. ..	(accepted) ..	**£1,295**	each
Ransomes, Sims & Jefferies, Ltd.		1,500	,,
Edison Accumulators, Ltd.		1,427	,,

Stirling.—T.C. :—
Condensing plant.—Edward, Dean & Beal, Ltd., £4,124.

Taunton.—T.C. :—
75-KW. transformer.—British Electric Transformer Co., £131.
Cable for a year.—Pirelli-General Electric Co.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Students' Section).—Saturday, June 28th. Visit to National Physical Laboratory, Teddington.
Monday, June 30th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, S.W. Paper on "The Oscillatory Valve Relay: a Thermionic Device," by Capt. L. B. Turner.

Industrial Reconstruction Council.—Tuesday, July 1st. At 1 p.m. At the Institute of Journalists, Tudor Street, E.C. Conference on "Health Work for Whitley Councils," to be opened by Dr. E. Halford Ross.

British Scientific Products Exhibition, Central Hall, Westminster.—Thursday, July 3rd, to Friday, August 5th.

NOTES.

The "Electrical Review" Index.—As it is still necessary to effect every possible economy in paper consumption, the Index to Vol. LXXXIV of the ELECTRICAL REVIEW, which will shortly be printed, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for 3d. post free. Any reader or advertiser at Home or Abroad who requires a copy for binding or other purposes is asked to make early application therefor to the Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, E.C. 4.

Burnley Technical Institute.—Messrs. Siemens Bros. and Co., Ltd., and Messrs. Jones & Shipman, of Leicester, have made gifts of engineering and other apparatus to Burnley Technical Institute.

Peace Celebrations.—The Electrical Development Association has called a preliminary meeting for Tuesday, July 1st, to consider the provision of lamps for Peace illuminations; the provision of strip devices and other material; the rates to be charged by electricity supply undertakings; and the provision of additional or heavier service connections where required. If necessary, further meetings will be arranged.

The British Science Guild.—At the annual general meeting of the Guild on Tuesday last week, the report of the Executive Committee was submitted. Amongst the subjects dealt with were University and Higher Technical Education, the Optical Industry, and the British Scientific Products Exhibition, which opens next Thursday. The Guild has drawn the attention of the Government to the urgent necessity of securing a strong optical industry in this country, and of protecting it against unfair competition. The accounts show receipts £883 and expenditure £533. A memorandum by the Education Committee, and a report by the Metric System Committee on the subject of decimal coinage, are appended to the report.

Irish Water Power.—The Board of Trade Committee on the Water Power Resources of Ireland will begin its sittings at Belfast on July 4th. On July 3rd the Committee will make a tour of the lower Bann, between Toome and Coleraine, and it will also visit Strangford Lough. Sir John Griffiths is the chairman of the Committee, and Prof. H. H. Jeffcoat, Royal College of Science, Dublin, is the secretary.

Battery Standardisation.—The Electrical Equipment Division of the Standards Committee of the American Society of Automobile Engineers has lately appointed a special sub-committee to study a standard form of rating for the accumulator batteries of farm electric lighting sets.

James Watt Centenary Commemoration.—A movement has been inaugurated in Glasgow to found a James Watt Chair of Engineering at the University. Birmingham engineers decided some time ago that a similarly named Chair should be installed in the University of their City, besides holding a Centenary Commemoration and erecting an international memorial to the three great pioneers, Watt, Boulton, and Murdock. The commemoration in Birmingham will take place on September 16th, 17th and 18th. London, Glasgow and Greenock, and, indeed, all parts of the country are heartily co-operating, and, with very few exceptions, the Universities and scientific societies, together with many manufacturers and individual eminent men, are associating themselves with the scheme. In the South Kensington Science Museum steps are being taken to arrange a comprehensive exhibition of Watt relics. In Birmingham the Watt relics, which have been preserved by the forethought of Mr. Geo. Tangye and a few years back were presented to the City, will be completely re-arranged and displayed, with many additions. Two pumping engines made by Boulton and Watt will be seen; one, the first sold by the makers in 1776, will be actually under steam and raising water.

A Memorial Service will be held in the Parish Church of Handsworth, where the three contemporaries are buried. A garden party will be held in the park at Heathfield Hall, where the garret workshop still remains as Watt left it. Lectures will be delivered by eminent men, and a centenary dinner will be held.

According to the *Times* a meeting convened by the Institution of Engineers and Shipbuilders in Scotland, held in Glasgow, has decided to raise a fund to commemorate the centenary of the death of James Watt by the further endowment of the engineering department of Glasgow University. Of the £50,000 required, about £6,000 is already subscribed.

Daylight Saving in U.S.—The House of Representatives has decided by 233 votes to 122 to repeal the Daylight Saving Law next October. The farmers object to the continuation of the law now that the war is over. The Senate has also voted by 56 votes to 6 in favour of the repeal of the Daylight Saving Law at the close of the present season.

Disabled Soldiers' and Sailors' Electrical Engineering Classes.—At the Royal Horticultural Society's Show, on Wednesday last, the Croydon Polytechnic had a number of exhibits of work done by disabled men, including wiring in casing; a complete "charging board," wired and fitted throughout, by a disabled man, for use in a country house or other installation for the owner to charge up motor-car or other batteries from his own electric lighting plant; a "Henley" joint-box, with a paper lead-covered and armoured cable led in and connections made between this and two V.I.R. tails; a specimen exercise in pipe bending; a piece of armoured cable, one end of which has been sealed with a lead cap, while the other end has a cable socket sweated on (the disablement of the man who executed this piece of work consists of amputation of two fingers and thumb on right hand, amputation of thumb on left hand and left eye removed); and test papers showing the practical character of the instruction given.

Fatality.—Whilst riding on the front of one of the Blackpool-Fleetwood tramcars, near Cleveleys, on the 18th inst., Frank Butterworth (44), an inspector in the employ of the company, was thrown from the car and seriously injured. He died two hours later.

Proposed Canadian I.E.E.—There is more than usual interest attaching, at the moment, to the question whether the electrical engineers in Canada shall form themselves into a Canadian Institute of Electrical Engineers, or whether they shall merge their identity in the organisation which until recently has been known as the Canadian Society of Civil Engineers, and is now called the Engineering Institute of Canada. According to the *Electrical News*, beyond the new name there is little evidence that the personnel of the Institute is different from that of the former Society, which view is borne out by the fact that a number of organisations have not looked upon the proposition of becoming part of the new Institute with favour, although the new name would indicate the intention that all branches of engineering should be included in one large comprehensive organisation.

Illuminating Engineering Society, U.S.A.—The election of the following officers of the Council for the fiscal year 1919-20 was confirmed by the Council on June 12th, 1919. These officers were elected to fill vacancies due to expiration of terms:—President: S. E. Doane. Vice-President: Wm. J. Clark. General Secretary: Clarence L. Law. Treasurer: L. B. Marks. Directors: E. C. Crittenden, F. E. Cady, R. B. Ely.

The E.T.U. and Disabled Men.—Mr. James Currie, Controller of Training, Ministry of Labour, gave evidence before the Select Committee of the House of Commons appointed to inquire into the working of the Pension Acts. He put in a list relating to Trade Advisory Committees, and, according to the *Daily Telegraph*, the statement regarding the electrical trade was as follows:—

"In certain branches of the electrical trade there was a fair opening for disabled men, but the Electrical Trades Union was extremely cautious in sanctioning the training of any considerable number."

The Electrical Development Association.—We understand that Mr. J. W. Beauchamp, director of the Electrical Development Association, has now commenced operations at Hampden House, 84, Kingsway, London, W.C. 2 (telephone: Holborn, 253), and will be glad to receive communications from readers associated with the housing schemes in connection with reconstruction. It is hoped in a few days to issue a preliminary pamphlet which has been prepared in connection with the work and objects of the Association.

The Conjoint Board of Scientific Societies.—The report of the Board for 1918 has just been issued. It states that the number of constituent societies is now 54; their contributions to the funds amounted to £490, and the expenditure to £520. With other items, there is a credit balance for the year of £27, and a sum of £47 is recoverable from the Ministry of Munitions. The Committee on the Application of Science to Agriculture, of which Sir John Snell has been appointed Acting-Convener, recommended the Board of Agriculture to grant funds for designing, constructing, and testing an electrical tractor and other agricultural machines; a deputation interviewed the Permanent Secretary, Sir Daniell Hall, on December 13th, 1917, and explained the Committee's views with regard to the application of engineering to operations on the land, and to the big electrical developments that were expected in the supply of motors for homestead purposes as well as on the land, but Sir Daniell Hall thought the time inopportune to deflect labour and material to the said purpose.

A report was submitted by Sir John Snell on an investigation made through Mr. Nugent Harris in the Bridlington district, with regard to a scheme for the supply of electrical power to the farms of a district containing 1,177 holdings.

The Watching Committee on Education has pointed out certain defects in the Report of the Commission on Civil Service Examinations, Class I, militating against the study of science, and has submitted a report on the scientific needs of the Civil Service.

The Metric System Committee has completed its report, which is under consideration.

The Iron Ore Committee has completed certain magnetic surveys, and finds that magnetic disturbances may be of use in determining the boundaries of ore fields, but are also caused by faults, &c., in other formations.

The Committee on the Water Power of the Empire has issued a report, which was abstracted in the ELECTRICAL REVIEW of August 16th and 23rd, 1918.

Inquiries.—Makers of fireclay bars for electric heating elements are asked for.

Appointments Vacant.—Director of research (£1,250) for the British Cotton Industry Research Association; electrical mechanic (£250 + £50) for the Government of Somaliland; jointer for the Borough of Bacup Electricity Department; electrical foreman (£323), chief draughtsman (£277), for the Royal Siamese State Railways; sub-station attendant (88s. 3d.) for the Hackney B.C. Electricity Department. See our advertisement pages to-day.

The Incorporated Municipal Electrical Association in Scotland.—At a meeting at Edinburgh, the constitution of the newly-formed Scottish Centre of the Incorporated Municipal Electrical Association was adjusted, and the following office bearers were appointed:—Chairman: Councillor Bruce Lindsay, Edinburgh. Vice-Chairman: Mr. W. W. Lackie, Glasgow. Hon. Secretary: Mr. D. Robertson, Depute Town Clerk, Edinburgh. Engineer Members of Committee: Messrs. Bell, Aberdeen; Hughes, Falkirk; Newington, Edinburgh; Smith, Paisley; and Richardson, Dundee. Municipal Members: Bailie Willock, Glasgow; Bailie M'Callum, Greenock; Bailie Coull, Leith; and Councillor Smith, Hamilton.

Qualities of Amorphous Carbon Electrodes.—The following values for the physical and chemical qualities of amorphous carbon electrodes are given by the *Mechanical World* from a German source: Specific weight, 1.5-1.55; specific resistance at cross sections of from 25 to 3,000 sq. cm., 45-100 ohms; electrical coefficient of temperature at from 25 to 900 deg. C., 0.000318; specific heat at 100 deg. C., 0.18-0.22; compressive strength, 230-410 kg. per sq. cm.; bending strength, 51-81 kg. per sq. cm.; heat extension from 0-700 deg., 0.26 per cent. of the initial value; heat conductivity for a cube of 1 cu. cm. at temperature falls from 130-20 deg. C., 0.24 heat units per hour; ash content, 2.5-3 per cent.; phosphorus, 0.45-0.53 per cent.; sulphur, 0.91-1.1 per cent.

The Association of Consulting Engineers.—The annual general meeting of this Association was held on May 30th, 1919, at Caxton Hall, Westminster, Mr. Frank Gill (chairman of the committee) presiding, who, in moving the adoption of the report of the committee for the year ended April 30th, 1919, mentioned the deaths of two members, Lieut. W. Llewellyn Preece and Mr. E. H. Stevenson. The report stated that during the year the work of the committee had been of a routine character. In September the Association was invited by the Institution of Electrical Engineers to nominate a representative to serve on a committee appointed by the Council of the Institution to consider and report on the "Report of the Board of Trade Electric Power Supply Committee," and the hon. secretary (Mr. A. H. Dykes) was selected to represent the Association. Subsequently a memorandum setting out the opinion of the Association was duly prepared and transmitted to the committee; a copy was afterwards sent to the President of the Board of Trade. During the year the British Standards Committee had on more than one occasion invited the Association to nominate some of its members to serve on panels. Mr. John May was nominated to a panel dealing with electrical power plugs and Mr. A. P. Trotter and Mr. A. H. Dykes to represent the Association at a joint conference of the Standards Committee and lamp makers on the grading and marking of metallic filament lamps. Recently the Association had been asked by the Board of Trade, Foreign Department, to assist the Government of India in selecting consulting engineers to advise on the utilisation of water power in that country. It had also asked for assistance relative to the position of consulting engineering work in Canada, and the Association had correspondence with the American and Swiss Associations of Consulting Engineers. With regard to the Institution of Electrical Engineers' agreement with the B.E.A.M.A. that the clause dealing with payments in the Institution's "Model Form of General Conditions" should be amended, the committee had informed the Institution that the Association had been unable to recommend its members to adopt these "General Conditions" and that this alteration was against the established practice of the majority of the members of the Association, particularly of the civil engineering members. The committee felt that a final reserve of 5 per cent. was insufficient and that the amount retained until the end of the maintenance period should continue to be 10 per cent.

The committee would be glad to have the views of members on this point before arriving at a final conclusion. Six new members had been elected, and it had been considered desirable to amend the official scale of fees on the time basis, those on the percentage basis remaining as before.

Mr. G. Midgley Taylor, in seconding the report, said that the increased recognition of the Association was a healthy sign, and he hoped that in the future they would elect all consulting engineers. After some discussion as to the revised scale of fees, the report was adopted unanimously.

The Threatened Electrical Lock-out: the Dispute Ended.—We have received the following official statement from Mr. Leonard G. Tate, general secretary of the National Federated Electrical Association:—

"I have been instructed to hand you the following statement:—

"*Subject.*—Dispute between the London Section of the National Federated Electrical Association and the London Section of the Electrical Trades Union, owing to the withdrawal of union labour from Messrs. Rashleigh, Phipps & Co., Oxford Street, thus leading to a threatened lockout of the members of the Electrical Trades Union in London. The committee appointed to investigate have reported as follows:—

"That in the opinion of the committee the position of Messrs. Rashleigh, Phipps & Co. in respect to the employment of union and non-union labour was seriously prejudiced by a letter written by them to the Electrical Trades Union dated July 3rd, 1914, as a result of which, acting on the advice of the committee, the members of the National Federated Electrical Association could not carry on the dispute on behalf of Messrs. Rashleigh, Phipps & Co., consequently the immediate difference between the National Federated Electrical Association and the Electrical Trades Union has for the moment disappeared."

Faraday House Dinner.—It was recently decided, in order to afford old Faradians from overseas an opportunity of meeting before returning home, to revive the activities of the Faraday House Old Students' Association, and accordingly the eleventh annual dinner was held at the Holborn Restaurant on Friday last, Col. Hubert C. Sparks, C.M.G., D.S.O., M.C., Croix de Guerre (avec Palme), president, in the chair. Several old Faradians who had come from abroad to take their part in the war were present, and the large attendance as well as the fact that this was the first dinner since 1914 afforded a unique opportunity of renewing old friendships, about 120 guests being present. The speeches were brief, and referred chiefly to Faraday House and its present and old students and their achievements, both as engineers and as members of H.M. Forces. During the dinner Miss Thenia Wrainch Walter's Harmonic Quartette played a selection of music, and after the toasts a musical entertainment was given by the following artists: Miss Gladys Vaile (comedienne), Mr. Lawrence Folker (baritone), Mr. Herbert Collings (conjurer), and Mr. Finlay Dunn (entertainer at the piano).

Transport Questions.—Meetings will be held at the Caxton Hall, Westminster, S.W. 1, on Monday, June 30th, at 8.30 p.m., to consider Mr. A. W. Gattie's "System of Cheap Transport," and on Monday, July 7th, at 8.30 p.m., to discuss the "Transport Bill and Housing Bill."

Sheffield and District Wireless Society.—A very enthusiastic meeting was held in the Council Room of the Sheffield Literary and Philosophical Society, on June 20th, when a permanently organised wireless society for Sheffield and the surrounding district was formed. Mr. H. E. Yerbury, M.Inst.C.E., M.I.E.E., who presided over the meeting, was elected as president for the ensuing year. It is proposed to secure premises in the centre of the city, if possible, where members may meet to read and discuss papers, and where eventually it is hoped, by arrangement with the Postmaster-General, to install an aerial and the necessary instruments for experimental work. The hon. secretary is Mr. L. H. Crowther, 156, Meadow Head, Norton Woodseats, to whom applications for membership should be sent.

Improvements in Electric Cables.—According to French Patent No. 487,577 of P. H. Chase, electric cables may be improved by winding around the insulating covering a strip of insulating material covered with a strip of metal with oblique slits cut in it. The slits are cut at such an angle that when the strip has been wound spirally round the cable the slits lie perpendicularly to the axis of the cable. This system reduces the dielectric losses and also the eddy current losses, and improves the thermic conductivity of the cable. Furthermore, the covering is an effective protection, and moderates the electrostatic strains.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Central Station and Tramway Officials.—Halifax T.C. is recommended to grant increases of salary to Mr. W. M. ROGERSON, electrical engineer, from £800 to £900; Mr. J. D. CAIRD, tramways traffic manager, £425 to £475; and Mr. J. W. GALLOWAY, tramways engineer, from £375 to £425.

Mr. A. W. SWEETINBURGH, assistant distribution engineer to Bury Corporation electricity department, is leaving after twelve years' service to take up a position as engineer representative with Messrs. Halwains, Ltd., Electrical Power Plant Specialists, of Bury.

General.—At the Woolwich works of Messrs. Siemens Brothers & Co., Ltd., on Tuesday last in the presence of a crowd of Mr. W. CULLUM'S fellow employés, Mr. Chauvin, the managing director, presented to him a jubilee gift of £50 in commemoration of his having completed 50 years' service with the firm. Mr. Chauvin mentioned that Mr. Cullum was the second of the same family to be such a recipient, his late brother three years ago having fulfilled a similar length of service. Mr. W. Cullum started as a boy in the line department, but was soon transferred to the cable department, where he witnessed the starting of the first two cable machines, and was engaged in various cable expeditions. Mention was made of many exciting escapes experienced by Mr. Cullum in the course of his duties. He was transferred to the lead cable shop on its inception, and has risen to the position of a foreman therein. On behalf of Mr. Cullum's fellow workmen Mr. Chauvin presented a testimonial in the form of a clock and umbrella and an envelope containing a sum of money for Mr. and Mrs. Cullum.

It is announced in the Press that Signor MARCONI is to be one of the new Italian Delegation to the Paris Conference.

According to the *Times* the Council of the Institution of Mining Engineers decided to present the medals of the Institution this year to Dr. AUGUSTE RATEAU, of France, and to M. WATTEYNE, of Belgium, in recognition of their work in the interests of mining, and as a tribute to two of our Allies in the war. In their absence, the medals were presented by the president to Professor Louis on behalf of Dr. Rateau, and to Sir William Garford for M. Watteyne on Monday last.

Mr. A. HENDERSON has resigned the post of electrical manager of Messrs. Scotts' Shipbuilding and Engineering Co., Ltd., Greenock, to accept an appointment with the Thermotank Company, 55, West Regent Street, Glasgow. He is succeeded by Mr. E. T. Caparn, formerly assistant electrical manager to Messrs. John Brown & Co., Ltd., Clydebank.

Messrs. MURRAY COOMBS & RICHARDS have opened offices as advisory and inspecting engineers at 25, Victoria Street, S.W.1. Telephone: Victoria 5488.

Major G. A. BRUCE, T.D., M.I.E.E., Tyne Electrical Engineers, has been restored to the establishment of the R.E. (Territorial Force) of which he was a supernumerary officer whilst employed with the R.E. during the war. He recently had the Territorial decoration conferred on him.

Lieutenant E. E. Walker, London Electrical Engineers, has been restored to the establishment of the R.E. (Territorial Force). Lieutenant Walker was commissioned in the corps in No. 4 Searchlight Company, London, in September, 1915, got his second star in April, 1916, and was seconded whilst employed with the R.E.

Lieutenant and Acting Captain A. M. Robertson, Renfrew Fortress Engineers, has relinquished the acting rank of captain on ceasing to be employed with effect from the 24th ult. He was commissioned in the Searchlight Company of the regiment in April, 1915, and subsequently given an acting captaincy whilst attached to a line unit.

Mr. James Settle, staff officer in the secretary's department at the General Post Office, is retiring at the end of June after 48 years' service.

Mr. R. Millett, who was recently engaged for some years with Messrs. Siemens Brothers Dynamo Works, Ltd., Manchester, has been appointed by the Electric Construction Co., Ltd., of Wolverhampton, as their sole Lancashire agent. Mr. Millett has opened offices at 30, Cross Street, Manchester. Telephone: No. 7772 City.

Mr. Donald Sinclair, A.M.I.E.E., for over 13 years resident engineer, General Electric Company (Glasgow branch), has been presented by the staff with a case of cutlery and a mahogany clock, &c., on the occasion of his marriage. The presentation was made by Mr. P. G. Sims, the manager.

According to the *Times* a marriage will shortly take place between Captain Vincent Ziani de Ferranti, eldest surviving son of Dr. Ferranti, and Dorothy, only child of Mr. and Mrs. Reginald P. Wilson.

Roll of Honour.—Sapper E. R. Sutton, R.E., who was previously with the Altrincham Electrical Supply Co., Ltd., has been awarded the Meritorious Service Medal for work in connection with the Third Army Signal Dumps.

Obituary.—We are pleased to learn from authoritative information that has now reached this country that the newspaper reports to which we referred last week were incorrect in so far as they related to any of the Messrs. Pirelli being on board the *Citta di Milano* at the time of the disaster. We, however, regret to learn that Commendatore Jona was lost. By the death of a gentleman of such high capabilities Messrs. Pirelli have suffered a heavy loss.

The death has occurred at Ballybough, Dublin, of Mr. Joseph Dowdall, electrical engineer, a contractor to the Corporation. He was 52 years of age.

Will.—The late Dr. Henry Wilde, F.R.S., bequeathed his books, papers, and scientific instruments to Oxford University.

NEW COMPANIES REGISTERED.

R. B. Hand & Co., Ltd. (156,193).—Private company. Registered June 18th. Capital, £1,000 in £1 shares. Electrical and mechanical engineers, agents, factors, merchants, manufacturers, etc. The subscribers (each with one share) are: S. Grundy, The Datcha, Teddington, electrical engineer; R. B. Hand, 35, Kashgar Road, S.E.18, electrical engineer. The first directors are R. B. Hand and S. Grundy. Registered office: 63, High Holborn, W.C.

Vactite Wire Co. (1919), Ltd. (156,012).—Private company. Registered June 12th. Capital, £25,000 in £1 shares. To acquire the business of a manufacturer and supplier of accessories to the incandescent electric lamp industry carried on by a company of similar name at 20, Coptthall Avenue, at Bollo Lane, Aston, and at Lower Walsall Street, Wolverhampton. The subscribers (each with one share) are: A. C. Hyde, Perivale Lodge, Perivale, W.13, electro chemist; Mabel J. L. Ferrar, 29, Eaton Park Road, Palmers Green, N.13, accountant's clerk; L. Beman, 20, Copthall Avenue, E.C.2; C.A. Solicitors: Smith, Goss, King & Gregory, 62, London Wall, W.C.

Anglo-Norwegian Electro Chemical & Finance Co., Ltd. (155,968).—Private company. Registered June 12th. Capital, £20,000 in £1 shares. To carry on the business as indicated by the title. The subscribers (each with one share) are: V. Vogt (Norwegian), Briarcourt, Hampton Hill, merchant; G. Christensen, 101, Leadenhall Street, E.C.3, merchant. Directors: V. Vogt, G. Hartmann, W. C. Eger and G. A. Jebson, all Norwegians, of 1, Bygdo Alli, Christiania. Registered office: 6, Great St. Helens, E.C.

Prideaux & Co., Ltd. (156,071).—Private company. Registered June 14th. Capital, £2,000 in £1 shares. To take over the business of gas and electric fittings manufacturers and brassfounders carried on at 7-8, Macdonald Street, Birmingham, as "Prideaux & Co.," and at Bracebridge Street, Birmingham as "Lea & Perrins." The subscribers (each with one share) are: T. Phillips, 7-8, Macdonald Street, Birmingham, fittings manufacturer; J. W. Lea, Bracebridge Street, Birmingham, fittings manufacturer. First directors: T. Phillips (permanent director and chairman) and J. W. Lea. Registered office: 107, Macdonald Street, Birmingham.

Suplyawl, Ltd. (156,109).—Private company. Registered June 16th. Capital, £3,000 in £1 shares Electrical, hydraulic and mechanical engineers, metal workers, hardwaremen, shipowners, carriers, wharf, pier and dock owners, &c. The subscribers (each with one share) are: E. S. Thomas, 15, Wetherby Mansions, Earl's Court, S.W.5, merchant; G. M. I. Blackburne, 5, Margaret Street, Cavendish Square, W., merchant. First directors to be appointed by the subscribers. Registered office: Rooms 506-7, Bank Chambers, 329, Holborn, W.C.1.

Metal Industries, Ltd. (156,191).—Private company. Registered June 18th. Capital, £39,000 in 20,000 preference and 18,000 ordinary shares of £1 each and 10,000 deferred shares of 2s. each. Mechanical and electrical engineers, iron, brass and metal founders and workers, steel platers, metallurgists, &c. The subscribers are: B. Peters, 15, Dean Street, S.W.1; C. H. Dade, 17, The Avenue, Beckenham; J. E. Spagnoletti, 14, St. James's Place, S.W.; P. D. Ionides, 76, Piccadilly, W.; W. Stokes, 32, Victoria Street, S.W. The first directors are to be appointed by the subscribers. Qualification, £500 shares. Solicitor: S. Morse, 79, Queen Street, E.C.4. Registered office: Manchester Hotel, Aldersgate Street, E.C.1.

Feuerheerd's Motors, Ltd. (155,697).—Private company. Registered June 2nd. Capital £20,000 in £1 shares. To acquire an invention relating to improvements in turbines, rotary pumps, air compressors, and the like, and to adopt an agreement between E. Feuerheerd of the first part, C. F. Quack of the second part, and R. G. Layton (for this company) of the third part. The subscribers (each with 100 shares) are: P. Layton, 7, Tithebarn Street, Liverpool, cotton merchant; A. Greaves, Gorseinon, Dudley Road, New Brighton, timber agent. First directors: E. Feuerheerd, Walton, 50, Lower Oldfield Park, Bath, and C. F. Quack, 12, Hackins Hey, Liverpool. Solicitor: R. G. Layton, 9, Fenwick Street, Liverpool.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Rushmores, Ltd. (formerly Rushmore Lamps, Ltd.).—Satisfaction registered May 21st, 1919, of £2,500, part of amount registered December, 1917.

Alderley & Wilmslow Electric Supply, Ltd. (47,663).—Return dated May 19th, 1919. Capital, £30,000 in £1 shares (20,000 ordinary and 10,000 preference). 15,009 ordinary shares taken up. £15,009 paid. Mortgages and charges, £15,000.

Bromley (Kent) Electric Light & Power Co., Ltd. (54,127). Return dated April 28th, 1919. Capital, £100,000 in £5 shares. 15,000 shares taken up. £75,000 paid. Mortgages and charges, £64,063.

Mather & Platt, Ltd. (60,387).—Capital, £1,000,000 in 40,000 preference shares of £10 each and 600,000 ordinary shares of £1 each. Return dated March 14th, 1919. All shares taken up. £317,000 paid on 29,200 preference and 25,000 ordinary. £683,000 considered as paid on the remainder. Mortgages and charges, nil.

London Electric Warehouse Co., Ltd. (67,568).—Capital, £1,000 in £1 shares. Return dated December 31st, 1918 (filed June 4th, 1919). Eight shares issued. £10 paid, leaving £80 in arrears. Mortgages and charges, nil.

Midland Electric Wire Co., Ltd. (104,571).—Capital, £5,000 in £1 shares. Return dated April 14th, 1919. All shares taken up. £5,000 paid. Mortgages and charges, nil.

CITY NOTES.

Marconi International Marine Communication Co., Ltd.

Mr. Godfrey Isaacs presided at the annual meeting on June 20th. He said that Mr. Marconi had been called by his Government to Italy on important business. The profit for the year showed a slight reduction due to providing and training a large number of operators in a very short time. The number of stations installed and worked by the company at the end of the year was 2,549, and it stood now at 2,638. Taking into consideration the large number of ships that had been lost during the war, they had every reason to be satisfied with their position. They looked forward to the benefit of their telegraphic receipts of which they had been deprived during the last 4½ years. Having regard to the very much larger number of vessels now fitted with wireless telegraph stations, the great increase in costal stations, and, above all, the greater acquaintance which the world at large had now of wireless telegraphy, they had every reason to hope that their telegraph stations on board ships would be more freely used in the future than they were in the past. He would not prophesy what might be the development of wireless telegraphy upon ships as a result of the navigation of the air. They looked for an additional source of revenue to the more general use on board ships of the direction finder, which had now been so very materially improved that it gave promise of proving of considerable value to navigators. That, together with Mr. Marconi's latest invention, promised to be a great boon to navigation. This new discovery provided a means whereby a ship in the densest fog might discern the approach of another ship if fitted with the apparatus, and ascertain the distance. They were at present engaged in giving a commercial shape to the new apparatus, and as soon as possible its value on board ship would be demonstrated. The speaker went on to refer to the great services rendered by their operators during the war, and to the men who had lost their lives. The company now employed upwards of 5,000 wireless operators; a large number of inspectors in all parts of the world; and a very considerable clerical staff. They proposed to reserve for and issue from time to time in all 100,000 of the 300,000 unissued shares, to those employed in the company who desired to interest themselves in it.

United Electric Tramways of Montevideo, Ltd.

The report to March 31st, 1919, states that the tramway system operated with the following results during the year ended October, 1918: Gross receipts, $1,787,412, an increase of $96,195; operating expenses $1,386,244, an increase of $149,251; net receipts $401,168, a decrease of $53,054, which at exchange of $4.7 to the £ is £11,289. The passengers carried were 47,928,606, an increase of 3,045,086; car miles run 7,038,427, a decrease of 473,456. Percentage of operating expenses to gross receipts 77.56, an increase of 4.42. The gross traffic receipts continue to improve. Operating expenses, however, are still high, mainly due to the excessive cost of fuel and freights during the whole year. In consequence of these abnormal costs there is a decrease in net receipts of £11,289. The effect of all the economies made by the company has been more than counterbalanced by increases in expenditure due to causes

beyond the company's control. The increased cost of fuel alone has exceeded the decrease in the net receipts. The cost of all materials for maintenance is still very high, and wages have increased in Monte Video as elsewhere. It is hoped, however, that a reduction of shipping freights during the current year may show a considerable improvement in the cost of fuel, which is the company's largest item of expenditure. The amount receivable from La Sociedad Commercial de Monte-Video in respect of revenue was £82,404. The profit and loss account for the year, after providing for administration expenses and charging £48,039 for debenture interest, shows a credit balance of £35,582, plus £13,296 brought forward. There is put to debenture redemption £4,461; to preference and ordinary share redemption, £2,500; to renewals and contingencies, £20,000; 6 per cent., less tax, on the cumulative preference shares, in satisfaction of arrears for the half year to September 30th, 1917, £11,250; carried forward, £10,669.

British Electric Traction Co., Ltd.

The gross profit for the year ended March, 1919, was £250,214, against £237,906 for the previous year. After deducting the general expenses and the amount written off sundry assets, £36,890, £213,324 remains, plus £112,116 brought forward. Debenture stock interest is £90,449; there is put to reserve £21,486; 6 per cent. is paid on the cumualtive participating preference stock, 3 per cent. dividend is recommended on the ordinary stock, leaving £130,952 to be carried forward. The net profit shows an increase of £4,102. The aggregate receipts of the associated companies continue to show an increase, but it is to a great extent counterbalanced by the increased cost of operation, due in a large measure to the continued rise in wages. The associated companies are pursuing the policy of setting aside larger provisions for future repairs and maintenance. The reserve will now stand at £475,000. The investments now stand at £4,283,736, and they yielded a revenue of £217,863, representing an average of 5.08 per cent. for the past year on the amount at which they appear in the balance sheet, as compared with 4.93 per cent. for the preceding year.

With regard to fares, the Statutory Undertakings (Temporary Increase of Charges) Act was passed in August, 1918. The Act does not, however, authorise any increase of fares which would be more than sufficient to enable three-quarters of the pre-war rate of dividend to be paid by the operating Company.

The Ministry of Ways and Communications Bill and the Electricity (Supply) Bill, if passed into law in their present form, may have a far-reaching effect on the interests of shareholders in tramway and electric supply undertakings. Efforts are being made by the representative Associations to obtain amendments, and the directors recommend shareholders to give the Bills their close attentiont

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Lancashire Power Construction Co., Ltd.—The report for the year ended March, 1919, shows that the trading profit of the Lancashire Electric Power Co. for 1918 was £48,014, plus £78 interest on hire-purchase plants, &c., making £48,092 compared with £42,031 for 1917. £5,721 was brought forward. Debenture interest absorbs £4,500; reserve fund £15,000; 6 per cent. dividend on shares, £30,000; carrying forward £4,313. The development of the Parliamentary company's business for two years is shown in the following:—

	1916	1917	1918
Units generated	40,842,652	43,744,919	49,181,898
Max. load in kw.	11,900	13,300	14,000
H.P. connected	30,600	34,000	35,800
Receipts	£97,964	£115,131	£136,746
Expenditure	£59,954	£73,583	£88,731
Prout on trading	£38,710	£41,548	£48,014

The revenue account of the Lancashire Electric Power Construction Co., Ltd., shows that the total interest, dividend, and other receipts for the year ended March, 1919, were £34,703. Debenture interest, trustees' fees, and general charges, £17,639; dividends 7 per cent., less tax, on the preference shares, and 6 per cent. on the ordinary, leaving £8,441 to be carried forward. In order to meet further capital requirements of the Parliamentary Co., an issue of 50,000 7 per cent. cumulative participating preference shares was made in December last.

Imperial Tramways Co., Ltd.—The gross receipts of the Middlesbrough, Stockton, and Thornaby Electric Tramways were £106,524, an increase of £23,736. Passengers carried 13,972,274, an increase of 753,127. Net profit of £18,966, against £16,540 for 1917. The substantial increase in traffic receipts has been almost wholly absorbed in additional expenditure for wages and materials. An agreement has been arrived at with the three Corporations (Middlesbrough, Stockton, and Thornaby) settling the procedure to be adopted for carrying out the transfer of the undertaking of the company within their respective boroughs. The report of the London and Suburban Traction Co., Ltd., intimating inability to recommend any preference dividend is referred to by the directors. The Imperial Co. holds 125,000 5 per cent. cumulative preference shares of £1 each and 122,120 ordinary of £1 each in that company. The available balance of the Imperial Co. is £23,917, and after payment of interest on the debenture stock, 6 per cent. on the preference shares, less tax, and 4 per cent. on the ordinary, less tax, £48 is carried forward.

Eastern Telegraph Co., Ltd.—Dividend at the rate of 3½ per cent. per annum, less tax, on the preference stock for the June quarter, and a quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of tax.

Rangoon Electric Tramway & Supply Co., Ltd.—The report for 1918 states that the cars travelled 1,494,544 miles, a decrease of 63,112 miles, and carried 21,202,591 passengers, an increase of 5,468,389, or of 34.75 per cent. Total receipts Rs10,79,573, an increase or Rs1,67,427, or 18.35 per cent. The directors have arranged for a considerable extension of the present tramway system. In the private lighting and power department gross receipts for current supplied amounted to Rs9,71,733, an increase of 5.28 per cent. Gross receipts of the house wiring and supply department amounted to Rs1,24,527, the profit realised being Rs20,173, as compared with Rs19,778. A revised agreement with the Rangoon Municipal Committee for public lighting of the city and suburbs has been signed for twelve years on mutually favourable terms. The gross profits were £77,661, which added to transfer fees and interest on deposits and investments in London, £2,912, makes £80,573. Net profit £24,039. The directors recommend a dividend on the Ordinary shares of 5 per cent. for the year, free of income tax, carrying forward £4,447.

Shropshire, Worcestershire & Staffordshire Electric Power Co.—Mr. W. L. Madgen presided on Monday at the annual meeting. He said that the demand upon their power stations had fallen off considerably since the armistice. The varied industries had received plenty of orders, but remedies had not been found for the shortage of labour and raw material. The result was that for the first half of the year this company experienced a reduction of output, and the plant was not so fully occupied as it would be when the district returned to ordinary peace conditions. Under the new conditions that were developing, more and more electrically-driven machinery would become essential to the purposes of increased production. The speaker went on to refer to the Electricity Supply Bill, and the amendments which might be effected to make it a really practical and useful measure.

Adelaide Electric Supply Co., Ltd.—The "Financial Times" states that extraordinary general meetings will be held on July 1st to consider a resolution providing for the increase of capital to £1,000,000 by the creation of 250,000 shares of £1 each to be called "A" Preference shares, and to be entitled to a cumulative dividend of 5 per cent., free of British income tax. The shares will be repayable at par on a distribution of assets and on a winding up, and will rank *pari passu* (both in respect of dividend and on a distribution of assets) with the 6 per cent. cumulative preference shares, and be entitled to one vote in respect of each five shares.

J. G. White & Co., Ltd.—Net profit for the year ended February 28th, £17,292. The investment account has been reduced from £393,323 to £219,198 by the recent liquidation of certain securities on advantageous terms enabling loans to be repaid. Balance at credit of profit and loss (including £43,041 brought forward) £60,333. Preference dividend 6 per cent. for the year, less tax; 6 per cent., less tax, on the ordinary; £16,000 to reserve; carrying forward £33,333. Reserve fund £200,000, out of which £30,000 has been appropriated for bonus in preference shares.

Electro-Bleach & By-Products, Ltd.—The profit for 1918, after deducting repairs, standing charges, depreciation, deferred repairs, bonus to employés, directors' additional remuneration, and excess profits duty, was £24,498, plus £1,670 brought forward. After meeting debenture charges, paying 7 per cent. on the preference shares, and 12½ per cent. on the ordinary, £4,000 is put to reserve (making it £10,000), and £394 is to be carried forward. The Inland Revenue department has allowed the company to appropriate out of the revenue, £10,000 for deferred repairs.

Crompton & Co., Ltd.—The "Times" City column for June 21st says: "We understand that Messrs. Sir W. G. Armstrong, Whitworth & Co., Ltd., are now in negotiation for the acquisition of a substantial interest in the well-known electrical manufacturing firm of Crompton & Co., Ltd. From such information as is at present available, it seems probable that the terms may be communicated to shareholders in the latter company in about a week from now."

New General Traction Co., Ltd.—For the year ended March, 1919, the revenue was £17,697, and expenditure, including debenture interest and income tax, £8,028. Profit £9,668, plus £8,630 brought forward. Dividend 4 per cent (less income tax). Carry forward £7,818. A dividend of 2 per cent. was paid by the Norwich Electric Tramways Co. for the year ended June 30th, 1918. The Douglas Southern Electric Tramways system has remained closed down during the year, but it is hoped to reopen for traffic during this season.

Stock Exchange Notices.—The following are to be officially quoted:—

General Electric Co., Ltd.—46,500 ordinary shares of £10 each, fully paid (Nos. 57,501 to 90,000 and 106,001 to 120,000).

Siemens Brothers & Co., Ltd.—120,000 shares of £5 each, fully paid (Nos. 1 to 120,000); 80,000 shares of £5 each, fully paid (Nos. 120,001 to 200,000); and £500,000 4½ per cent. debenture stock.

Waygood-Otis, Ltd.—For the year ended March 31st the profit was £27,253; balance brought in, £17,405; £6,000 to reserve. According to the *Financier* the directors propose to pay 12 months' dividend on preference, which includes all arrears, and a dividend of 2½ per cent. on ordinary, leaving £3,405 forward.

Globe Telegraph & Trust Co., Ltd.—Net revenue for the year ended May 31st, 1919, after deducting expenses £227,424, plus £1,180 brought forward. £6,000 has been transferred to reserve for contingencies; 6 per cent., less tax, has been paid on the preference shares; 8 per cent., free of tax, on the ordinary; £1,629 is to be carried forward.

Victoria Falls & Transvaal Power Co.—Final dividend on the preference shares of 4 per cent., less tax (making 10 per cent.) for the year 1918; a dividend of 3 per cent., less tax, on account of the year ending December 31st, 1919; and a dividend on the ordinary shares of 5 per cent., less tax, in respect of 1918.

Montreal Light, Heat & Power Co.—Year ended April 30th: Surplus earnings, $1,042,890. Provision for depreciation amounts to $6,268,801, which will in due course be required for replacement of worn-out and obsolete plant. Regular quarterly dividends have been paid at the rate of 4 per cent. per annum.

Aluminium Corporation, Ltd.—The accounts for 1918 cannot yet be submitted as excess profits liabilities are not settled. They will be ready by the autumn, but the results of the year's trading are such as to justify the payment of the preference dividend for 1918.

Blackpool & Fleetwood Tramroad Co., Ltd.—A special meeting of shareholders will be held in Manchester on July 1st for their formal consent to be given to the transfer of the undertaking to the Blackpool Corporation.

W. & T. Avery, Ltd.—Final dividend of 10 per cent., making 15 per cent., less tax, for the year, on the ordinary shares.

India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.—Interim dividend of 2½ per cent. (5s. per share), free of tax, on ordinary shares.

Provincial Tramways Co.—Interim dividend of 8d. per share on the ordinary shares.

Coventry Chain Co., Ltd.—Interim dividend of 6 per cent. per annum on the ordinary shares.

Callender's Cable & Construction Co., Ltd.—Dividend of 12½ per cent., less tax, on the ordinary shares.

STOCKS AND SHARES.

TUESDAY EVENING.

THE German consent to sign the Peace Treaty has had little effect in the Stock Exchange markets. That the final result was assured, sooner or later, had been felt for some time past, and the twelfth hour wriggles of the enemy fell flat as a market factor. Nor has the Loan campaign entirely dried up the fount of ordinary business. New issues are permitted to appear, although an official hint is given as to their restriction. An interesting one is the offer of £200,000 in 10s. shares by the Metropolitan Railway Country Estates. Three properties, covering in all 627 acres, have been acquired in Hertfordshire and Middlesex, in the district served by the Metropolitan Railway and the Metropolitan Great Central Joint Line. The land is to be laid out to meet the requirements of all classes of residents, and we believe this is the first company of its kind that has been issued since the war. The Board is a good one, and the venture will appeal to a wide circle of speculative investors. It appears to have very fair prospects of success. Sound management will naturally form an essential part of the new company's success.

The Adelaide Electric Supply Company is taking powers to increase its capital to a million pounds sterling by the creation of 250,000 "A" cumulative preference shares of £1 each to be entitled to a 5 per cent. dividend free of British income tax. It is said that the underwriting commission is 3 per cent. Considering the financial strength of the company, a welcome to its new shares can be regarded as assured.

London Labour Party leaders deem very unsatisfactory the provisions of the Government's Electricity Supply Bill. They stamp the Bill as an incentive to "privateering." The authorities to be set up they—the London Labour Party Executive—declare to resemble on a national scale "the corrupt chaos of Boards and Commissioners for special services existing in London prior to the Metropolis Management Act of 1855." The statement lacks little of pungency and picturesqueness.

Immediately following this several of the companies themselves have circularised their shareholders with a memorandum which capitulates "the chief objections to the Bill, and they urge you," to quote the covering letter of the Kensington and Knightsbridge Electric Lighting Company, "to request your Parliamentary representative to support such amendments as will protect the existing rights and legitimate interests of shareholders."

In these circumstances it is not surprising that electricity supply shares should be dull and heavy. Westminsters have gone back sharply to 5½. County of London ordinary are obtainable at 9 11-16. Chelseas and Charing Cross have both given way. The manufacturing group is rather easier. Electric Constructions are 1-16 lower. British Westinghouse preference eased off to 2¾. Telegraph manufacturing issues keep up well. Callenders have gained 7s. 6d. British Aluminium at 35s. have improved.

British Electric Traction ordinary stock weakened to 44 on the appearance of the report. Net profits increased about £2,500 to nearly £123,000, and the dividend is maintained at 3 per cent. This rate has now been paid for the four successive years 1916-1919 since the capital account was reorganised in 1915. Some had hoped for 4 per cent. this time, and the slight disappointment caused the decline in the price of the stock. Underground Electric "A" shares are a shade lower at 10s. 3d., and the other issues are also easier. Metropolitan Railway Stock is better at 26¼ in sympathy with a general advance in home railways, brought about, rather mysteriously, by the reports of the Coal Commission.

Cable issues are again somewhat easier on sales by holders who want to transfer into the new Loan. Eastern ordinary, Globes and other members of this group have come to market during the past few days. It is further suggested that the successful spanning of the Atlantic by the aeroplane is another reason why proprietors of cable stocks are deeming it wise to exchange into the new Loan. To-day (Tuesday) a harder tone supervened, and part of the previous decline was recovered. Marconis keep steady. Canadians have been up to 19s., but are now 18s. 3d. Marconi Marines at 3 7-16 are ¼ below the recent best, and American Marconis went back a little to 30s. 9d.

Brazilian Tractions spurted to 62½, and held their rise. Mexicans are merely marking time. Rubber shares have recovered, on a rally of twopence, to 1s. 10½d. per lb., in the raw produce. Armament issues are firmer, and the coal and iron division derived a little support from the reports of the Coal Commission. Bombay Electric ordinary has risen 5 points to 50. Madras Electric ordinary advanced to 16s. 6d., Rangoon Electric to 4¼ and Calcuttas to 7¾.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price June 24, 1919.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES					
Brompton Ordinary	10	8	6½	—	£5 8 16
Charing Cross Ordinary	4	4	8	— ¼	6 18 4
do. do. do. 4½ Pref.	4½	4½	8½	—	6 18 4
Chelsea	5	8	8½	— ¼	4 12 4
City of London	8	8	11½	—	6 14 6
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	9⅝	— ¼	7 1 9
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	6½	—	5 4
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	5	6	8½	—	7 14 10
Metropolitan	4	5	8½	—	8 0 0
do. 4½ per cent. Pref.	4½	4½	8½	—	6 18 6
St. James' and Pall Mall	9	10	7½	—	7 0 4
South London	5	5	2½	—	7 5 6
South Metropolitan Pref.	7	7	9⅛	—	8 16 7
Westminster Ordinary	9	8	5½	— ½	7 5 6
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	98½	—1½	6 1 6
do. Def.	1½	23/6	29½	—	7 8 0
Chile Telephone	8	8	7	—	5 14 4
Cuba Sub. Ord.	7	7	11	—	*8 4 5
Eastern Extension	6	6	16	— ¼	*5 0 0
Eastern Tel. Ord.	8	9	16½	— ½	*4 19 1
Globe Tel. and T. Ord.	7	8	16	—	*5 0 0
do. do. Pref.	6	6	10½	+ ½	5 11 7
Great Northern Tel.	22	22	83	—	6 17 6
Indo-European	13	13	65	—	5 18 2
Marconi	20	20	6½	+ 1/16	3 4 0
Oriental Telephone Ord.	10	15	2 3/16	—	6 9 0
United R. Plate Tel.	8	8	6⅛	—	*4 18 6
West India and Panama	1/8	1/8	1 7/16	—	*4 6 4
Western Telegraph	8	8	17	—	*4 14 2
HOME RAILS.					
Central London Ord. Assented	4	4	68½	—	5 5 0
Metropolitan	1	1½	26½	+ ½	4 16 0
do. District	Nil	Nil	9⅛	—	Nil
Underground Electric Ordinary	Nil	Nil	8⅞	— ¼	Nil
do. do. "A"	Nil	Nil	10/8	—3d.	Nil
do. do. Income	4	5	95	— ½	*5 5 3
FOREIGN TRAMS, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	42	+ ½	8 6 4
Anglo-Arg. Trams. First Pref.	5½	Nil	3 1/16	+ 1/16	—
do. do. 2nd Pref.	—	—	8⅛	—	—
do. do. 5 Deb.	5	5	68¾	—	7 8 5
Brazil Tractions	—	—	62½	+2½	—
Bombay Electric Pref.	6	6	11½	—	5 11 7
British Columbia Elec. Ry. Pfds.	5	5	64¾	—	7 13 6
do. do. Preferred	Nil	2½	49½	+1	5 3 1
do. do. Deferred	Nil	Nil	44½	—	Nil
do. do. Deb.	4½	4½	61½	—	6 17 10
Mexico Trams 5 per cent. Bonds	Nil	Nil	62½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	50½	—	Nil
Mexican Light Common	Nil	Nil	27	—	Nil
do. Pref.	Nil	Nil	61	—	Nil
do. 1st Bonds	Nil	Nil	66	—1	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	31½	—	9 16 0
British Aluminium Ord.	10	10	1⅞	+ 1/16	5 14 5
British Insulated Ord.	25	19½	2 3/16	—	5 11 1
British Westinghouse Pref.	7½	8	2⅞	—	5 16 5
Callenders	25	25	10⅜	+ ⅜	5 17 8
do. 6½ Pref.	5	6½	5⅞	+ ⅛	6 2 10
Castner-Kellner	35	20	2½	— ¼	7 5 6
Edison-Swan, "A"	—	—	1½	—	6 0 0
do. do. 5 per cent. Deb.	4	5	7⅛	—	6 12 8
Electric Construction	10	10	1 3/16	— 1/16	8 8 5
Gen. Elec. Pref.	6	6½	10⅜	— ⅜	6 5 4
do. Ord.	10	10	22	+	*4 11 0
Henley	35	35	2½	—	5 2 6
do. 4½ Pref.	4½	4½	9	—	6 0 0
India-Rubber	10	10	17½	—	*6 13 8
Siemens Ord.	—	10	6½	—	*7 4 0
Telegraph Con	20	20	25½	—	4 13 6

*Dividends paid free of Income Tax.

TARIFFS ON IMPORTED MANUFACTURED GOODS.

By C. R. BELLING.

Some friends have suggested that I should explain my views a little more on the above question, having referred to it in our advertisements at different times.

The reasons why I am convinced that it is impossible for me to compete with the American manufacturers of heating and cooking appliances, unless we do have an import tariff, are as follows :—

1. At the present time the home American market for these appliances is the biggest market in the world. It is probably five times as big as the rest of the world put together.

This home market they keep entirely to themselves by imposing an import tariff of 65 per cent. on any foreign-made goods.

2. Owing to this big home demand, and to the knowledge that this home market is secure, the American is enabled to install plant to manufacture on a very large scale.

3. The fact of being able to manufacture in large quantities reduces his labour cost per article to a lower figure than could be reached in this country, notwithstanding that the labour rates in this country may be slightly lower than in America.

4. On top of this, however, the labour rates in this country have gone up to such an extent recently that they are now not far below the American.

5. American industry has received a tremendous impetus during the war, as she has been supplying practically all the world. Whilst we have been making war material, her factories have practically never been disorganised.

6. No question of better brains, better training, greater ingenuity, better methods of production, is necessarily involved.

That is, we should still be unable to compete with America, even if we produced an exact duplicate of an American article, both as regards appearance, efficiency, and finish, and produced it by exactly the same method of manufacture—*because* we shall never be in the position to produce the same large quantity, not having the same markets available to sell them in.

They have their own vast market, *plus* the rest of the world. We have the rest of the world only.

Hence my conclusion that it is obviously impossible for me to compete with the American, who is in a position to make far bigger quantities *and* at a lower labour cost each.

Result :—Unless we have a tariff on heating and cooking appliances, I shall have to close down, except on the heavier class of cast-iron articles.

But it is not just the fact of my being closed down that counts ; unfortunately, every skilled and relatively skilled trade is open to the same competition, owing to exactly the same facts and conditions—that is a protected home market giving the manufacturers a larger total market—reducing the labour cost per article, and, perhaps, most valuable of all, giving the manufacturer confidence.

This country before the war was undoubtedly losing all its high-class work, and importing this class of goods instead, paying for them in the main by goods produced by unskilled sweated labour, or by raw materials, or getting the goods on credit (which must be happening at the present time, our imports being about three times the value of our exports), or by services rendered which are always relatively unskilled, and therefore badly remunerated.

The question is whether it is good for this country for its skilled industries to be closed down, even if, temporarily, prices should be slightly higher for home-made goods ?

Of course, the Free Trader will immediately say, "Why should the consumer not be able to buy in the cheapest market ?"

This question opens up the whole and the broadest discussion of fiscal policy, on fundamental grounds.

Perhaps the broadest reply is : Why have America, Germany, and Japan, all tariff-walled countries, so rapidly built up new industries, gradually, but surely, forcing us to close them down here ?

This practically applies to all highly skilled trades. Take watches, typewriters, lenses, electrical ware, gloves, dye-stuffs, cutlery, automatic machinery, small tools, motor-cycles, motor-cars, tires, pianos, magnetos, and,—well the list is endless. Shipbuilding is, perhaps, the most recent industry attacked.

If we take it that goods are paid for by goods—which they must be ultimately—as credit or cash is merely the equivalent of a promise to pay in goods, it follows that all goods we import are eventually paid for by goods we export (or by service), and therefore they must be equal in exchange value.

The crucial point, and the point on which the well-being and prosperity of the nation depend—is the nature of the goods (or services) given in exchange.

If we give goods which require the labour of 100 men for a given time, in exchange for goods which have only taken the labour of 50 men the same time, we are the losers, because obviously with 100 men (such as we employed), the other country would have either time to spare for leisure, or to produce double the value of goods.

As an example, take the case of steel ingots, which mean mostly man handling. We export these and receive in exchange, say, finished needles. To send us the equivalent exchange value in needles demands the labour of far fewer, these being produced by skilled brain-work combined with automatic machinery.

Obviously the country making the needles has, at once, the advantage ; as, in addition to having a balance of needles over, they employ fewer men for an equivalent exchange value, and do not use up their irreplaceable raw material.

Hence, it will be seen that the most prosperous country is the one which skilfully produces the finished articles, and wastes least irreplaceable raw material.

Now, it must be obvious that the country adopting protective tariffs is able to determine and to foster the highly-skilled, highly-paid wealth-producing industries, and that country must, as a whole, be better off, wealthier, and its population able to live under more congenial conditions.

Now, to return to the Free Trader's original question —"Why should not the consumer be able to buy in the cheapest market ?"

The answer is that if the article in question is one which is made in a tariff-walled country, he is obviously still more strengthening the position of that country—in that he is increasing the production in that country, to the detriment of production in his own country, of the particular article he purchased ; and such article is invariably of the highly-skilled, high-wage paying class.

Now the value of currency has a definite relation to goods produced ; therefore, the more goods produced in any country, the greater the purchasing power of the unit of currency in that country.

This is why the tariff-walled country is strengthened by the increased production in its highly-paid trades, and how all classes of its community are benefited, and why their conditions of living are better.

The present value of the English sovereign is low because our production is low.

Our production in the highly-skilled, wealth-producing trades cannot be recovered or even maintained, whilst some nations adopt tariffs and we Free Trade.

To return once more to "buying the cheaper article." It is agreed that eventually any article brought from a foreign country has to be paid for in goods or service by this country ; but, as before explained, tariff-walled countries are enabled by their tariff to discriminate in the particular trades which they will foster, and they naturally choose the trades which make the biggest profits.

They thus eventually compel the Free Trade country to

pay for the highly-skilled, highly-paid goods which they import into it, by taking in return raw materials—such as coal and iron (on which our future and very existence depends), or manufactured goods on which the lowest grade of unskilled labour is employed—or else manual service of some kind, also unskilled.

In time this means either the entire depopulation of the Free Trade country in question, or, at any rate, its degradation to the position of becoming general labourers, that is, doing the digging, mining, labouring, navvying, portering, carrying, and all the other hard demoralising unskilled work for the rest of the world.

All these unskilled trades mean low wages, unemployment, discontent, and probably revolution or Bolshevism.

Therefore, the man who buys the low-price foreign-made article is helping to eventually cut the ground away from under his own feet, or his son's feet, unless he is anxious to become a labourer or an unskilled man, instead of a highly-paid skilled artisan, like the workers in America, who now have their motor-cars.

The whole question can, of course, only be finally decided politically.

That is, the matter will have to go before the country—be fought out in the old way, the Free Traders voting for such M.P.'s as promise to support Free Trade, and the Tariff Reformers *vice versâ*.

The biggest vote lies with the working classes. The catch phrase, "Your bread will cost you more" (coupled with the big funds behind Free Trade propaganda), has, up to the present, carried the day.

The first step necessary to alter the present fiscal policy of this country is to teach the working classes the true position; to carry out propaganda work amongst them, and to convince them that their present wages and future prosperity depend on increased production in the highly skilled, highly-paid trades, which can only be achieved by Tariff Reform.

Every manufacturer should tackle his own employés at once.

The next general election (very soon) will probably be settled wholely and solely on this issue.

Why not get ready for it?

It may appear that any efforts made by manufacturers to convert the policy of the country are selfish ones, but, on the other hand, what are the efforts of the Free Trade party but purely selfish and personal ones?

The Free Trade party, although the smallest actually, have just been the cleverest, and enlisted the vote of a larger body of workers in this country by their ("Your food will cost you more") propaganda, and thus carried the day.

Manufacturers must risk what motives are assigned to them, and must now take steps to protect their industries and those they employ, by acting individually in their efforts to convert, first of all, their own employés, and then combining in further efforts to convert the fiscal policy of the whole country—generally.

I would suggest that your columns should be opened out for discussion of both sides of the fiscal question, as far as the electrical industry is concerned.

THE TROUBLE MAN'S "TROUBLE."

By C. SYLVESTER, A.M.I.E.E.

I have been a "trouble man" myself, and I understand to no small degree the difficulties with which they are beset.

Their trouble does not commence with travelling long railway journeys, or waiting for hours on railway station platforms, or tramping miles across country in the rain or snow. It commences when they are actually on the site of their "trouble," and it is usually not confined to *this* trouble alone.

I remember a case where a man was sent to a large power station to see to a newly-erected rotary converter; there was something wrong with the over-speed device. He had not been on the job an hour when the engineer-in-charge came along and inquired how long it would be before the machine was running. When the trouble man told him he did not know, the engineer immediately got on the 'phone to the works, and complained that the "trouble man" did not understand the job.

Now, this was hardly fair or reasonable; because it is almost impossible for anyone to locate even small troubles in an hour or so. As a general rule, the trouble men of leading electrical manufacturers are experts in their own particular class of work. A rotary converter trouble man is a rotary converter expert, and his firm would not think of sending him on a job, say, to look at the carbon packing rings of a Curtis turbine. Yet, as soon as he arrives upon a job where trouble exists he is expected to perform the proverbial "miracle."

Another case that I remember quite well, because I was connected with it, was where a trouble man was sent to see to the exciter of a 6,000-kw. turbo-generator. Here the exciter had been changed, and it was necessary to test it up to 25 per cent. overload for a certain period. To test this exciter it was not considered desirable to impress the exciter voltage across the rotor slip-rings, since to test the machine efficiently the load had to be more or less flexible—that is, from 25 per cent. of full load to 25 per cent. overload.

The only obvious thing to do was to obtain some wooden barrels or a wooden tank, use a solution of caustic soda, and with iron or steel plates to place the desired load on the machine.

In this case, the trouble man knew what to do, but could not very well do it, because when he requested the loan of two empty wooden oil barrels he was told they could not be spared. This meant that he had to roam about the town, where he eventually borrowed a suitable receptacle to hold his solution. It would not have mattered a great deal had the matter ended here. It did not. The station superintendent wrote a letter to the man's firm complaining of the delay, with the result that the man experienced "trouble" when he returned to the works.

That there is need for greater sympathy and co-operation between the engineer and the trouble man there is not the slightest doubt. If an engineer can assist the trouble man, then he should do so by hook or by crook. He should realise that the trouble man's object in life is to overcome difficulties. He should understand that the trouble man never meets the "satisfied" customers. He should give a little thought to the fact that when one commences to overcome difficulties it is not known what one may have to contend with. It is this, the trouble man's "unknown quantity," that makes him appear to be a nuisance to everyone. It is this that makes him scratch his head when he finds that he will have to borrow tools or material which he has not brought with him. Some trouble men would rather go into the street to buy a file or a roll of Blackley tape than ask for it at the power house store, where the storekeeper appears to have a continual grudge against "them contractors."

Even here the trouble man's "trouble" is not ended. On one occasion, I remember a man going outside the works to which he was sent to grind the commutator of an exciter. The reason he went out was to purchase a carborundum stick; the only tool that will efficiently grind a commutator on site. He had not left the power house five minutes when the station engineer telephoned to the man's firm and complained that "their man had arrived, but, after a look round, he had gone for a stroll down the street."

And so I could go on quoting cases where the trouble man meets trouble other than that which he sets out to meet. To a certain extent, however, the trouble men protect themselves against engineers who have a greater use

for the pen than they have patience. Each firm's trouble men have a black list, and when they meet an engineer who is on their black list they mind their P's and Q's more than they would do if they met a more genial engineer.

I do not wish to create the impression that all engineers, power house or otherwise, are always on the track of the trouble man. This is not so. Every engineer desires to see his plant in as perfect a working condition as is possible. He does not wish to see any portion of his plant broken down, or waiting for, or under, repairs. When this happens, he is robbed, so to speak, of a certain amount of spare power. This he can ill afford to lose, especially at the times of peak load in the winter, when a large lighting load is being carried by the machines. It is only natural that he should be anxious, and it is probable that his anxiety, at times, overcomes his knowledge of the fact that the trouble man is doing his best.

I do not hold a brief for all trouble men, because they are not all as good and conscientious as they might be. An engineer has a perfect right to complain, and to have men removed from the works at once who show slackness.

It may be said, however, that trouble men are specially selected by their employers. In addition to ability they must possess tact. They must be able to turn a complaint into a compliment; they have the reputation of their firm at stake, and if they smooth the path between a dissatisfied customer and their employer they are rendering their firm a valuable service.

It is true that some trouble men make mistakes. They should not forget that they are not the only persons who understand the machine they have been sent to rectify. They are not sent to teach, but to rectify a defect. I think that if trouble men were to observe rules similar to those set out below, there would be a much better understanding between them and the engineer-in-charge :—

1. Report immediately upon arrival on site.
2. Never leave the job without leaving word where you are going to.
3. Give all the information you can concerning a defect, at the same time studying the manufacturer's interest.
4. Give all information willingly. Do not assume a mysterious attitude when conversing with the engineer concerning the behaviour or efficiency of a machine.
5. Always point out the good features of a machine, and never refer to defects which have developed in other machines. Defects make themselves known quite clearly when they develop.

On the other hand, the engineer should do all he can to assist the trouble man. He should place his workshop and stores at his disposal. He should lend him additional labour, if it is required. Every bit of assistance that the trouble man is given means that the job will be got running much quicker. Before making a complaint to the manufacturer, if the trouble man is on the spot, he should be consulted. Small mistakes and misunderstandings can be easily overcome by candid conversation. When an engineer g es on a job he should be pleasant. He should talk to the trouble man, and if he thinks the job is not being tackled correctly he should say so.

A complaining or dissatisfied customer is a liability with an ever increasing ability to do the manufacturer harm. A complimenting or pleased customer is an asset, the value of which is continually increasing. In order that any business may succeed, its assets must at least equal its liabilities. If a manufacturer does not liquidate his liabilities in the form of complaint and dissatisfied customers, he will soon go into bankruptcy. A customer who cheerfully admits that a defect has been tackled with skill and speed is no longer a liability. As a matter of fact, complaining customers can often be handled in such a way that they become good boosters—or, in other words, good assets.

A good many firms have as their motto—"The customer is always right." This is really the attitude which should be taken by every firm. It is an axiom, however, which should not be regarded lightly. It is the foundation on which complaints of any nature should be handled. Regardless of whether the manufacturer or customer thinks himself in the right, every complaint should be heard in full, and the matter concluded in such a manner that the customer is completely satisfied.

It sometimes happens that the customer himself is to blame for a defect. Even so, he must not be told this. It is something he can find out for himself if the complaint is handled properly.

No matter how or where the blame is placed, it must be remembered that the trouble man is the medium through which the defect is rectified, and both manufacturer and customer are satisfied. So let the engineer and trouble man work together in harmony, and the rectification of defects will become a pleasure on both sides, instead of a nuisance.

VACUUM-VALVE AMPLIFIERS.

THE first important technical problem which the Army faced in expanding its wireless development work was that of obtaining suitable vacuum valves. The success with which this need was met may be judged from the fact that at the cessation of hostilities the production rate in America was in excess of 1,000,000 per year, and large reserve stocks had been accumulated.

In recent issues of the *Electrical World* interesting articles recited briefly the story of this remarkable war-time development. In July, 1917, the valves marketed in the States were too unstable, critical, non-uniform, and required careful adjustment for successful operation. The U.S. Signal Corps, therefore, decided to develop two types, one suitable for receiving and the other for transmitting, so balanced in their adaptabilities that they would serve, either separately or in combination, for any uses contemplated. All apparatus was to be designed to employ one or both of the standard types. The receiving valve had to operate as a detector of damped oscillations, as an oscillating detector of continuous oscillations by the heterodyne method, and as an amplifier of telephonic—and telegraphic—frequency alternating currents. The power valve had to be an efficient oscillator for the production of wireless-frequency A.C. power, and serve as a modulator of such power for wireless telephony. Furthermore, adjustments of both types had to be reduced to the absolute minimum.

Specifically, the valves must show uniform operation over ranges of 20 per cent. variation of filament and plate voltages, since no rheostats or potentiometers were to be allowed, and the valves must automatically adjust themselves over the range of voltage (initial to discharge) impressed by the fixed storage and dry batteries or dynamotors used in the circuits. This requirement was a radical departure from ordinary practice. All valves were to possess a high degree of electrical and mechanical ruggedness, a reasonably long useful life, and also to have and retain a high vacuum.

The ideal condition desired was that it should be practicable to replace any valve operating in any set by any other valve of the same type without affecting the operation or requiring any readjustment of the set. The first type of U.S. Signal Corps amplifier built, and the one used most successfully and in the largest quantities, was entirely devoid of adjustments of any kind. A box contained the transformers, wiring, dry battery units and valves, and was provided on the outside with two binding posts for direct connecting to a 4-volt storage battery, with two binding posts for the input current to be amplified, and a jack for the insertion of the plug of the standard telephone head-set. There were no knobs, switches, or rheostats whatever. With power valves the conditions are more severe, and in some cases a filament rheostat has been used. However, this is only to compensate for gradual battery voltage drop due to discharge and the frequency of its adjustment is measured in hours. The receiving valve which was finally adopted by the U.S. Signal Corps was the coated-filament type VT-1, illustrated in figs. 1 A and B, developed and manufactured by the Western Electric Co. As shown, the corrugated plates, punched from sheet steel, form a cylinder at the bottom which fits tightly around the glass stem. At the top they join again, and are clamped about a small square plinth of special insulating material. The grid, also punched from sheet steel, is supported at the bottom by the lead-in wires, and at the top by bracing wires embedded in the plinth. The V-shaped filament of twisted platinum strip coated with thermionically-active compounds is held taut by an insulated spring support at the top. Thus the whole structure is rigidly tied together and clamped tightly to the stem. The base consists of a metal shell with a phenol-fibre diaphragm at the bottom which carries the connecting studs. In assembly the base is fitted over the bottom of the tube, the leads are soldered to the contact studs, and the whole is inverted and poured full of insulating wax. The ends of the contact studs are capped with a non-corroding alloy, as are also the faces of the connecting springs in the sockets. This ensures dependable contact under all climatic conditions.

The normal filament current of this valve is 1.1 amp. The filament circuit requires a 4-volt storage battery, while the plate circuit operates from a 15-cell dry battery unit. When provided with the proper input transformer the average valve will give a power amplification of 200, *i.e.*, a two-stage ampli-

fier composed of two of the valves in cascade will give out 40,000 times the A.C. power fed to its input terminals. The average life of the valve is in excess of 500 hours. The ordinary characteristic curves of the VT-1 are given in fig. 2. Several excellent valves of the tungsten-filament type were developed to the same specifications and standards as the VT-1, but none of these combined the necessary features. Some of them excelled in certain respects, but were deficient in other important respects.

The development of power valves proceeded more slowly than that of receiving valves, and the difficulties to be overcome were greater. The valve finally adopted for U.S. Signal Corps use was a coated-filament type developed and manufactured by the Western Electric Co., known as type VT-2, illustrated in fig. 1c, and its characteristic curves are given in fig. 3. The normal filament supply is 1.36 amp. at 7 volts. The plate voltage is normally between 250 and 350 volts. The normal high-frequency power output is 3 watts, but over 5 watts may be obtained without exceeding the safe limit of operation. While its output-input ratio as an amplifier is

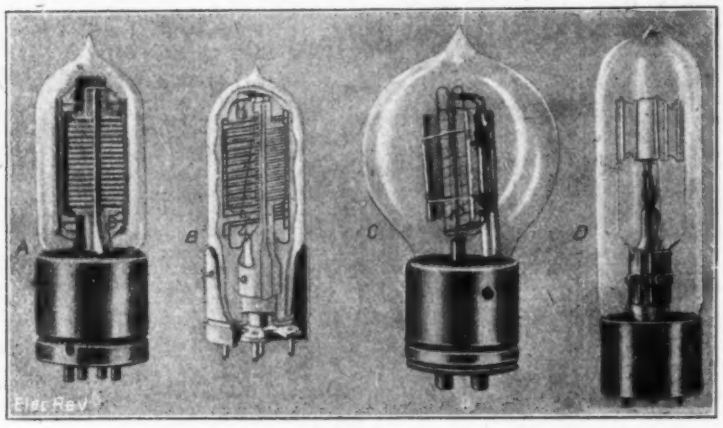


Fig. 1.—U.S. Signal Corps Vacuum Valves.

not much greater than that of the VT-1, it is capable of handling considerably more power, and has thus been used. One or two types of tungsten-filament valves were developed along with the VT-2, but although they possessed desirable characteristics, they were not able to maintain the same standard of performance and efficiency.

These are by no means looked upon as the final solution of the problem, and other very promising lines of development are under way.

Two main improvements are required in the receiving valve —a considerable decrease in the power necessary to heat the filament so that storage-battery equipment can be reduced, and a decrease in the electrostatic capacity which will improve operation as a radio-frequency amplifier, particularly for short waves. The VT-3 valve which has been developed and manufactured on an experimental basis by the Western Electric Co. has these two improvements in view. Its filament requires only 0.2 amp. at 2 volts. The filament power input is thus less than 0.5 watt, as compared with 4 watts for the VT-1.

The possibilities of the tungsten-filament tube when designed to use the larger filament input and higher plate voltage to which it is inherently better suited are illustrated by the VT-8 type (fig. 1D), developed by the General Electric Co. (U.S.A.). It requires a filament current of 6.5 am. at 10 volts and operates at a plate potential of 700 volts to 800 volts, is capable of giving an output of 30 watts high-frequency power, and its characteristics make it well suited to use as a modulator. Its characteristic curves are given in fig. 4. The valve is considerably more powerful than is required for the average equipment, but for certain higher-power equipment gives more satisfactory results than the combination of several low-power tubes in parallel.

The "Type P" "Pliotron" made by the General Electric Co. is a vacuum tube capable of producing 100 watts of high-frequency power. It takes a filament current of 3.5 amp. at 25 volts; approximately 0.2 amp. at 1,500 volts is required by the plate. The valve is rather expensive, and as now constructed is fragile. Nevertheless, from the electrical standpoint it is fairly reliable, and a limited use has been made of it. Valves have been constructed similar in form to the type P, which can successfully deliver a quarter kilowatt of high-frequency power. Such tubes usually require 2,000 volts or 3,000 volts potential on the plate electrode.

Preliminary to the standardisation of the valves themselves a standard design of base and socket was made. The four-contact bayonet type was selected, and the bases for receiving and transmitting tubes were made identical except for the angular position of the locking pin. In the bottom of each socket was placed an insulating shield pierced by four holes, which allowed the base contact studs to project through and touch the contact springs beneath. This shield and the angularly displaced locking pins precluded the possibility of a valve being placed in the socket improperly or in the wrong socket.

Aside from measuring instruments and storage batteries, a testing set consists of three parts—the amplifier test set, the detector test set, and the oscillator test set. In the amplifier test set the valve to be tested amplifies an 800-cycle alternating current. A double-throw switch allows of cutting the telephone head-set into either the input or the output side of the valve. The output side is provided with a variable shunt of the constant impedance type. The shunt is adjusted until the shunted output gives a signal of the same loudness as the direct input. The reading of the shunt is then a measure of the power amplification given by the valve. In order to pass inspection a valve must give more than a certain ratio of power output to power input. For the VT-1 type this ratio is 121. In the detector test set the valve is compared as a detector of modulated radio-frequency oscillations with a calibrated standard valve, and must show equivalent or better signal response. In the oscillator test set the valve is connected to a standard circuit, in which it must cause continuous oscillations if it is to be passed as a satisfactory oscillator. The tests are carried out at two filament and plate voltages corresponding respectively to the upper and lower variation limits of these factors under severe conditions.

The sets are conveniently arranged so that other necessary measurements can be made in connection with those mentioned. The resistance of the filament circuit is measured, and must fall within certain specified limits so that the tubes will operate properly in series or in parallel without losing their interchangeability. The plate current is measured and is held to a certain maximum limit, so as to reduce the drain on the small dry battery which in service supplies the current. A measurement of grid current is made under conditions such that it is indicative of the amount of gas in the tube, which must be within a limiting value. A determination of the insulation resistance between the various electrodes is made, and the limit of this resistance is specified.

The sockets in the testing sets are ground accurately to size, and form automatic limit gauges which indicate defective valve bases as inserted for test. A careful visual inspection for bent electrodes, broken welds, cracked glass, loose or broken contact studs, and similar defects is carried out. In the amplifier test the valve is jarred to detect noise due to excessive vibration of electrodes or any tendency of adjacent electrodes to strike together and short-circuit. A certain percentage selected at random are forwarded to the National Bureau of Standards for life and mechanically destructive tests.

For power valves the requirements of mechanical perfection were the same as for receiving valves. Similarly, equivalent tests for gas, insulation resistance, ruggedness, life, and filament resistance were applied. Tests for operation as oscil-

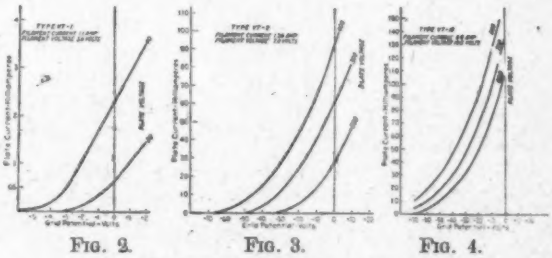


Fig. 2. Fig. 3. Fig. 4.

Characteristic Curves of Valves.

lators were made in a standard circuit. Specified power outputs were required for varying conditions of filament and plate voltage. An overload test was made in which the valve was operated a short time at excessive input. A test was applied which caused the rejection of valves unsuitable for operation as modulators.

Two other evacuated valve devices have been classed with vacuum valves in their development. These are the regulator valve and the ballast lamp. The former consists of a hot cathode and single, cold anode, similar in general arrangement to the Fleming valve rectifier. The latter is merely an iron-wire filament normally operating near its recalescence temperature, and maintained in a low-pressure hydrogen atmosphere. These two tubes are used in the aeroplane wireless telephone set for automatically regulating the voltage of the fan-driven generator.

An interesting article in the *Journal of Electricity* deals with the manufacture of vacuum valves as carried

out in a San Francisco factory under the supervision of Capt. R. W. BREWER, of the British Army, who has taken an important part in the development of vacuum valves.

The British Service has used wireless telephone sets for more than two and a half years past, and the vacuum valves in connection therewith have been worked out to a degree of nicety by engineers in England. They are based on the invention of Mr. O. B. Moorhead, of San Francisco, who holds an American patent for the cylindrical anode. The Moorhead valve, in addition to having the cylindrical anode, has a spiral grid and a central filament, making a completely concentric arrangement so that the distance between each of the elements is the same in all directions.

In the modern device great care and ingenuity are displayed in eliminating all traces of gases from the inside of the valve, and a most severe test is imposed to ensure that there shall be no blue glow when a high voltage is impressed on the anode and a specified dissipation is taking place inside the valve.

Not the least interesting feature of the Moorhead valve is the mechanical construction thereof, it being the only valve which is not truly hand-made. Valves are being produced which are absolutely uniform and mechanically sound.

The bulbs in the rough must first have their stems shortened to the required length and be tubulated for pumping. The tubulating is performed in a machine having two heads, one of which fuses the glass where the pip is formed, this being blown out by a small internal air pressure. In the meantime the tube is heated under another gas flame, and the bulb is transferred to the carrier holding the tube, and the two parts are fused together. It is then taken to a head having a ring of flames which play upon the stem, the surplus metal falls by gravity and the end of the stem is blown out and broken off, thus leaving a bell mouth for sealing in the elements. Two machines are employed for sealing the element support wires into their stems, each machine having four heads, and two more machines each with four heads seal the completed elements into the bulbs. After each sealing-in process the glass members are immediately placed in rotary annealers to eliminate cracking. After inspection the valves then pass to the pumps for evacuation; each oven for pumping is fitted with a Langmuir mercury-vapour pump, and holds 50 valves at once. The degree of vacuum requisite to ensure a reasonable length of life is far in excess of anything that has previously been attained commercially. The rate of pumping exceeds 1,000 valves a day, with only about half the ovens in operation. Some of the machines which have been produced to ensure uniformity and accuracy in the manufacture of the elements deserve particular attention.

The tungsten filament, which is of exceedingly fine diameter, must be very accurate in respect to its electrical resistance, and it also has to withstand a considerable degree of overload in testing. The tungsten wire is first crimped in a motor-driven rolling mill, long lengths of wire being treated at one time. After the supporting wires have been sealed into their glass stem they are cut off to exact length in a combined machine; the first operation of the lever shears off the surplus metal, the stem is then placed in another position, and a small hook is formed in the short wire which supports the lower end of the filament. The end of the hook forms the locating point for future operations.

The grid consists of a spiral coil which is wound in two-foot lengths from a spool of nickel wire. Each gird is cut off to exact length, and is welded to its supporting wire in exact place by an electric spot welder. The anode cylinders are first stamped out from nickel strips and rolled into form in a specially constructed mill having three power-driven rollers; they are then welded on to the supporting angle piece by an electric spot welder.

This system of spot welding has required a great deal of care in attaining its present state of perfection, as the work has to be done most accurately, and the shapes and sizes of the material worked upon are very awkward.

After these elements have been centralised, the top supporting wire for the filament is placed under a drop hammer which flattens it at the bend, and gives it the necessary amount of spring to take up the expansion of the tungsten filament when heated. To fix the filament to the supporting wires it is riveted in place in a machine with two heads, which gauges off the exact length of filament every time. The surplus metal is cut away by hand.

The valve bases are cemented in place on a machine which is motor-driven and has six double heads. In the first carrier the valve is brought opposite a gas jet which dries out the cement while the valve itself rotates, and upon touching a trigger the head rotates through half a revolution, and the valve is brought opposite to an air stream which cools it down.

The remarkable uniformity of the product is evidence of the perfection of this system of manufacture.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "G.E.C. "Buoy" Hand-lamp.

Recognising that some of the electric hand lamps which have been put on the market in the past have lacked certain qualities which make for convenience and long life, the GENERAL ELECTRIC CO., LTD., Queen Victoria Street, London, E.C. 4, has developed a new hand lamp for industrial purposes which is known as the G.E.C. "Buoy" hand lamp, and has been very thoroughly tried and tested. It is illustrated in fig. 1. The base, of black insulating material, weighs approximately 1¼ lb. The guard is of strong tinned steel wire of

FIG. 1.—G.E.C. "BUOY" HAND LAMP.

light weight; the base, owing to its curvature and weight, will keep the lamp upright, however it is first placed. It will stand also on a gently sloping surface, and can be used without any greater care than is commonly accorded material by unskilled labour in heavy industrial work. It is very compact, measuring only 8½ in. long by 4½ in. diameter, is provided with both a side and top hook, is easily grasped, and as it can be hung or stood anywhere *both hands are left free*. It complies with the Home Office regulations with regard to hand lamps for use in factories, and will be found invaluable in all industrial situations.

Colliery Transformers.

A new type of colliery transformer, for use actually in the pit, has been designed by the British Westinghouse E. and M. Co., Ltd., of Trafford Park, Manchester, and recently placed upon the market. The illustration, fig. 2, shows a typical 3-phase, 50 periods, 300-K.V.A., 2,200/500-volt colliery transformer recently installed. The type generally has been developed with a low overall height, making it suitable for passage in the pit. It is mounted on wheels fitted to run on any gauge of track to be encountered in mining work. The underframe is constructed to act as a buffer from either end to protect the cooling tubes from possible damage, and is so designed as to permit of couplings being attached at each

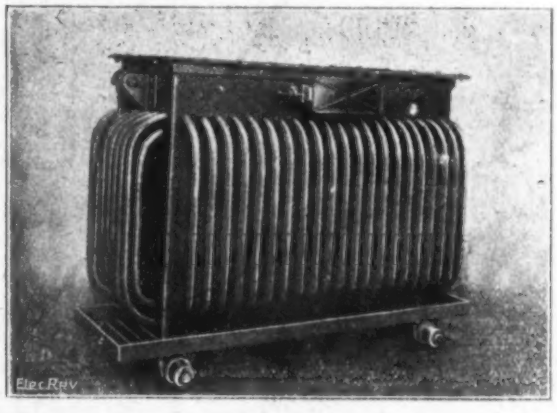


FIG. 2.—WESTINGHOUSE COLLIERY TRANSFORMER.

end. Mechanical robustness and safety from risk of explosion and fire have been the primary factors in design. The tanks are of boiler iron fitted with external tubes to give the requisite cooling surface, and the cable terminals, &c., are constructed so that no soldering need be done in the pit. Trifurcating or bifurcating boxes for armoured cables are fitted; these comply with the Home Office regulations for fiery mines. So far this type of colliery transformer has been made up to 300 K.V.A., 3300 volts, at 50 periods, 3-phase.

ORWELL ELECTRIC VEHICLES.

On the occasion of the visit of the Incorporated Municipal Electrical Association to Ipswich last week, the electric vehicle department of the Orwell Works of Messrs. Ransomes, Sims and Jefferies, Ltd., was thrown open to inspection. The works was founded in 1789 to manufacture the ploughs for which the firm is famed, and now employs over 3,500 men in shops covering 30 acres. The products of the works include railway material, agricultural machinery and portable engines, lawn mowers, and, during the war, enormous quantities of munitions of very diversified character. New shops covering 2¼ acres were erected for building aeroplanes, and on the cessation of hostilities the electric vehicle department, which was inaugurated during the war, was transferred to these shops, which will be devoted entirely to the manufacture of Orwell electric vehicles. It is interesting to note that the company has built self-propelled vehicles since 1842, and claims the credit of being the first British manufacturing firm to place battery-propelled commercial vehicles on the market.

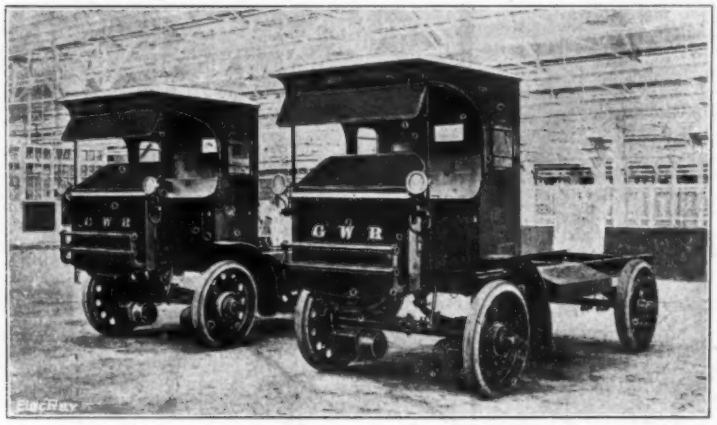


Fig. 1.—Orwell 2½-Ton Vehicles.

We have on previous occasions published particulars of Orwell vehicles; they are fitted with "Ironclad Exide" batteries, for which a service of 25,000 miles is claimed without dismantling the battery for repairs, and are driven by two motors on each vehicle, thus dispensing with mechanical differential gear and the usual transmission. For 2½ tons capacity the vehicles have a front-wheel drive, the motor pinion meshing with an internal gear attached to the wheel; a 3½-ton size is made, with a rear-wheel drive, and several types of industrial trucks are also manufactured, carrying 3,000 lb. each.

The electric vehicle department is well-equipped with all kinds of machine tools, including drills, combination and capstan lathes, milling and grinding machines, and helical gear-cutting machines, which are all electrically driven; gauges and jigs are made on the premises, and all components are inspected at various stages of manufacture to ensure their interchangeability and quality. Physical, chemical, and microscopic tests are applied to all the materials used, in a laboratory well supplied with up-to-date apparatus. The order of manufacture is controlled by a Progress Department, and the system of manufacture is highly organised to facilitate assembly. Heavy forgings, castings, and woodwork for the electric vehicles are produced in the adjoining engineering workshops and foundry.

Figs. 1 and 2 show respectively two 2½-ton trucks which form part of a fleet of four supplied to the Great Western Railway, and a 2-ton tipping wagon supplied to the City of Edinburgh for refuse collection; both types are fitted with the firm's patent two-motor front-wheel drive, and the tipping wagon is operated by an independent electric motor. The Orwell vehicles are designed on the Mossay system; two batteries are used, slung under the chassis, the controller is fixed under the driver's seat and is actuated by a pedal and lever, the standard charging socket of the E.V.C. is provided, and two independent expanding brakes act on each of the rear wheels. The frame consists of pressed steel girders, and the wheels are of wrought-steel with cast-steel hubs.

The visitors were impressed by the excellence of the workmanship and the substantial construction of these vehicles, which, combined with the simplicity characteristic of electric propulsion, go far to explain the comparative immunity of the vehicles from the need for repairs over long periods.

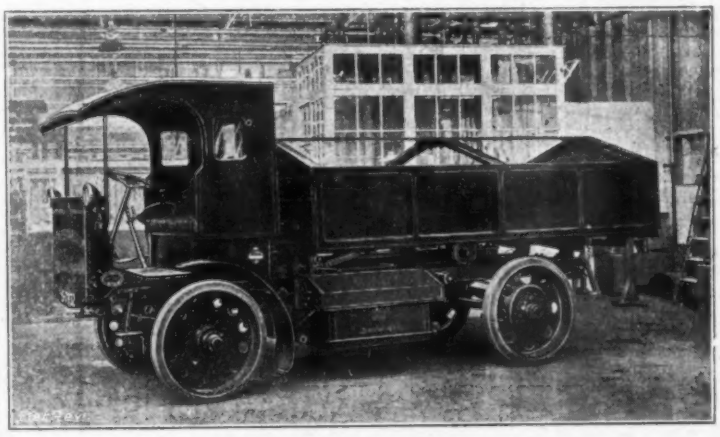


Fig. 2.—Orwell 2-Ton Tipping Wagon.

LEGAL.

Braulik v. Davis.

In the City of London Court, on June 20th, before his Honour Judge Atherley-Jones, K.C., an action was brought by Mr. George Braulik, electrical fittings manufacturer, 8, Lambeth Hill, E.C., against Mr. J. Davis, traveller in electrical fittings, Hornsey, to recover £38 13s. 6d., moneys collected from his customers. Defendant counter-claimed £34 6s. 4d. for commission due to him, the claim being practically admitted. Mr. Cairns appeared for the plaintiff and Mr. H. H. Trusted for the defendant.

Mr. Cairns said that the defendant was engaged as the plaintiff's traveller in 1915 when all the plaintiff's travellers—four or five in number—had gone to the war. Defendant had paid himself the commission in dispute by collecting accounts from plaintiff's customers. He had paid £4 into Court, to balance the claim and counter-claim. Plaintiff engaged another traveller named Rodda to deal with the Northern counties of England, and had paid him the commission for which the defendant was now counter-claiming. Defendant was engaged to travel the whole of England as far as he could. He had at start £2 a week and 5s. expenses while travelling in London, and when in the country the expenses were increased. Defendant also had a commission of 2½ per cent. on approved orders accepted and executed by the plaintiff. The terms to customers were that cash was to be paid on or before delivery. In December, 1916, defendant gave a month's notice to leave the plaintiff's employment. Then, in January, 1917, he was re-engaged as the London and country representative. Plaintiff was anxious that defendant should visit all customers at least three times a year. Plaintiff wrote in October, 1917, and told the defendant that a man named Rodda, who lived in Manchester, was to see him with a view to becoming a traveller for the plaintiff. Defendant was told to see Rodda, which he did. On November 3rd, 1917, defendant saw Rodda and engaged him to take over Ireland, Scotland, and the North of England, Rodda saying that he had a connection in the electrical trade. Rodda worked Lancashire and Yorkshire and the Northern Counties. Defendant said that Yorkshire and Lancashire were not northern counties, but the plaintiff maintained that they were. Defendant claimed to be entitled to travel in Yorkshire and Lancashire to the exclusion of Rodda.

Judge Atherley-Jones did not know that Lancashire and Yorkshire were northern counties. The northern counties used to apply to Westmoreland, Cumberland, Northumberland, and Durham.

Mr. Cairns, continuing, said that the defendant sent a circular to the plaintiff's customers telling them not to have anything more to do with Rodda, who was travelling for the plaintiff. In spite of that fact, the defendant was now claiming commission for the business which came in during the six weeks after he ceased to act for the plaintiff. The defendant wrote to the plaintiff's customers urging them not to give orders to Rodda, and adding that "it was the old story of the scrap of paper." One customer wrote and said that Braulik was always doing the same sort of thing, and that he never bought of Braulik what he could get anywhere else. The Yorkshire Electrical Wiring Co., of Sheffield, pro-

mised to send the defendant their orders direct. The defendant had since given an undertaking not to circularise plaintiff's customers, because it was a distinct breach of the agreement. Defendant was now asking for commission for orders which had come from customers whom he had never interviewed. It was impudence on the defendant's part to say "give me commission on orders which I have not been able to intercept," for that was what he was doing. It was impossible for one man to cover the whole of England and Ireland and Scotland, as defendant seemed to think he was entitled to do. Plaintiff had never given him, since Rodda was appointed, the exclusive right to the whole of the country. Surely the plaintiff could employ as many travellers as he liked. No electrical business or any other could grow properly if one man were allowed to represent it over the whole country. Furthermore, it would be against public policy. When a Continental company employed a man as sole agent he, in his turn, employed sub-agents in this country. For a firm to be told that they must employ one traveller was absurd. All the customers involved were the plaintiff's old customers, and not new ones brought in by the defendant.

Judge ATHERLEY-JONES said that would certainly make a great difference.

Mr. CAIRNS further said defendant was claiming commission for orders obtained in Scotland, although he had never been there. He was claiming to be entitled to commission on orders taken by Rodda.

Mr. GEORGE BRAULIK, the plaintiff, was called, and said he had never promised the defendant commission on orders taken in Scotland and Ireland. The defendant was not entitled to an over-riding commission in any sense, Rodda was employed to extend the business, and defendant was directed to engage him, which he did. But the idea of both of them being entitled to commission was absurd. He had paid Rodda commission for the orders he had taken, and now defendant was demanding commission as well. He always treated defendant liberally. On one occasion he paid the defendant a sum for commission to which he was not entitled, but he gave it him as a bonus to end squabbling which ensued. It was untrue that he had trouble with other travellers.

Mr. DAVIS, the defendant, said his relationship with the plaintiff was very difficult, speaking generally. He entered his service in 1909 and left him, but returned in 1915. Generally speaking, he had done very good business for the plaintiff. He was to have an over-riding commission for Scotland and Ireland to the same amount that Rodda had. Plaintiff told him to insert an advertisement in the ELECTRICAL REVIEW which he did, and so got into communication with Rodda, whom he engaged. Plaintiff was to have nothing to do with Rodda, who was to work entirely under witness's jurisdiction. It was distinctly understood that he was to have a commission on all business which Rodda did. That was absolutely definite.

Defendant further said that he did not fix the remuneration for Rodda, as that was determined by Braulik. He had no recollection of receiving a letter of October 31st, and he would almost swear that he had not had it.

Judge ATHERLEY-JONES thought after the defendant's reply of November 3rd to the letter of October 31st it was scarcely worth pursuing the matter. In commission claims one always endeavoured to be as liberal as possible in one's interpretation of contract in favour of the man who had rendered service. That seemed to him to be a very wholesome rule for a Court to observe, and no doubt in a very large proportion of cases the agent who served in return for commission was very much at the mercy of the principal. A principal having got perhaps a connection from an agent who had entered into an improvident contract then discharged the agent from his service, and reaped the fruit of, perhaps, many years' labour in aggregating or in piling up a goodwill. But that was not the present case. The defendant's function was merely that of visiting plaintiff's customers who had belonged to the plaintiff and obtaining orders from them. The defendant had not presented any case which was worthy of consideration, and he found judgment for the plaintiff for £36 19s. 10d. on the claim and counter-claim.

BATTERY MAKERS FINED.

AT Ashton-under-Lyne County Police Court, last week, Messrs. Oldham & Sons, electric accumulator lamp manufacturers, of Denton, were summoned for failing to comply with the regulations governing works engaged in the manufacture of electric accumulators, by not having at least 500 cubic feet of air space for each person engaged in the casting room, and for not providing one lavatory basin for every five persons employed.

Mr. D. WALMSLEY, H.M. Inspector of Factories, said that the defendants manufactured electric accumulator lamps used in collieries and on ships. Some time ago they commenced to make electric accumulators themselves, and they were charged with overcrowding the casting shop, and having insufficient washing-bowl accommodation for the whole of the works. It was very necessary that the regulations should be carried out, in order to prevent the men getting lead poisoning.

Mr. W. F. CHAMBERS, for the defendants, submitted it was a purely technical offence. The business had been carried on for half a century, and during the whole of that period there had never been a complaint against the firm for contravening any Act. The firm had not committed the offences wittingly. Owing to the war, the heads of the firm had been working at a great strain, and Mr. Oldham, the head of the firm, and one of his sons, had broken down. The firm had been called upon to manufacture a large number of accumulators; they had extensive contracts with the Navy and with different collieries in Yorkshire. They had been compelled to manufacture the accumulators themselves, with the result that although the premises had been much extended they proved to be somewhat inadequate. The firm had endeavoured manfully to complete its contracts, and in one case if the goods had not been delivered within a certain time there would have been a strike at a colliery which would have involved 5,000 men. Mr. Chambers submitted the firm had been endeavouring to benefit the nation by supplying the articles which prevented a strike.

The magistrates imposed a fine of £5 5s. in each case.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Working Speeds in Radio-Telegraphy.

My words in your issue of the 6th inst., and referred to by Mr. Godfrey C. Isaacs in the ELECTRICAL REVIEW of June 20th as having appeared "under the heading of 'Working Speeds in Radio-Telegraphy'" were headed by me "An Appeal for Information."

You, Sir, doubtless with the best of motives, but to my regret, altered my title.

I would not venture to write on radio-telegraphic commercial working speeds in up-to-date long-distance practice—a subject outside my present personal experience and knowledge.

It was only in view of the apparently conflicting nature of the statements quoted by me (ELEC. REV., June 6th) that I made "an appeal for information." This information Mr. Godfrey C. Isaacs, managing director of Marconi's Wireless Telegraph Co., Ltd., has kindly vouchsafed in your current issue, under the form of an interesting explanation of Madrid-London wireless working conditions.

Among my most cherished souvenirs is a radio-telegram over eleven years ago—by an old friend and oft-time shipmate—sent to me at Wimbledon from Montreal, Canada, and received by me "*viâ* Marconi," with a total delay of 15¼ hours; not a bad performance in those days considering the landline connections, &c.

Years ago there were rumours that a goodly proportion of "wireless" traffic really passed over the cables. Personally, the writer kept an open mind. Mr. Godfrey Isaacs's recently reported statements, however, have caused me to fear that my souvenir Marconigram of eleven years ago, after all, may have pulsed through an Atlantic cable. He has informed us that "the wireless traffic has grown beyond the company's capacity to handle. They had to advise customers that they could not accept traffic, and they had to cable thousands of words which could not be handled by wireless."

In this case, therefore, wireless conditions seem to have increased congestion of the cables. It is pleasant, however, to read, in Mr. Isaacs's ELECTRICAL REVIEW letter, that, in the Madrid-London instance, the "wireless service" has greatly relieved the congestion of the cables.

Finally, one must not forget that Mr. Godfrey Isaacs has said his contention all along has been that the wireless does not take away from the cable traffic, but creates additional traffic by offering lower rates.

E. Raymond-Barker.

London, *June 23rd*, 1919.

[Our choice of titles for correspondence is guided solely by the consideration that the title should indicate, as clearly as possible in brief, the subject of the letter, a condition which we think was fulfilled in this case; an "appeal for information" conveys no information to the reader, but the word "radio-telegraphy" at once attracts the attention of anyone interested in that subject—Mr. Godfrey Isaacs, for instance. Mr. Raymond-Barker's present letter was headed "Radio-Telegraphs"; that would have served very well in the first instance, but if the title were now changed the letters would probably be indexed under separate headings. In the body of the first letter it was clearly stated that the letter was "an open and sincere appeal for exact information," which was duly forthcoming.—EDS. ELEC. REV.]

Resettlement.

During the past week I had a visit from a member of the E.T.U. He came to ask what he should do, when he got his demobilisation through, about finding a job. I, bearing in mind all that has been said about resettlement, finding jobs for our "Boys," and making England a "fit place for heroes" to live in, advised him to visit his former employers, who would no doubt be able to fix him up. This he did. But with what result? Sad to say not the expected result. Oh yes, they were quite prepared to fix him up, but at what a wage? £1 18s. per week—this to a man 27 years of age.

Now, who do you think were the philanthropic people who were prepared to pay such a princely sum? Hold your breath. . . . Messrs. ———— & Co., of London.* When it is pointed out that the district rate for an assistant is now about £3 11s. 6d., it is quite easy to see how generous (?) these people are. No wonder the discharged man is saying: What did I fight for, and who? A word before closing to "H. A. Harding," a correspondent in this week's issue; he draws, I think, the only conclusion possible from the case he quotes *re* the grants. That is, that the E.T.U. is *the* organisation for the electrical worker. In closing I would ask him to seriously consider the position before going so far as to assist in yet another Association being formed; I think he will agree that the main trouble at the moment in the industrial world is that there are by far too many Associations, each trying to score a point one against the other, with what result we can all see. My advice is: take the E.P.E.A. and the E.T.U., put one against the other, judge for yourself which is *the* one, then join that one. Remember inside you can do a lot, but outside your hands are tied.

Robert J. Thompson, Local Secretary, E.T.U.

Walthamstow, *June 23rd*, 1917.

[* Without inquiry, we think it inadvisable to give the name.—EDS. ELEC. REV.]

A Colossal Blunder.

If attention has not already been drawn to the following extract, it may prove of interest to your readers, as illustrating how even so reliable a publication as the "Encyclopædia Britannica" may occasionally give somewhat misleading information. The "howler" referred to is to be found in the American reprint of the 9th edition (published *circa* 1895), Vol. XVII., Addenda, under the heading "Motors, Electric." As the newspapers say, "comment is superfluous":—

". . . Many people fail to understand how it is that an electric motor furnishes power. . . . The principle of the motor's operation is the application of the current through the wires or brushes to the commutator, which may be termed the axle of the motor. This commutator is made up of a great number of sheets of brass, spreading out radially and separated by insulating material. These commutator bars cause the alternating currents produced in the armature to flow in the same direction externally, on what may be unscientifically called the "hub." A repellant action is produced between these commutator bars and the brushes, an action similar to that of the magnetic needle. This repellant action of the current from the brushes produces a pushing result on the commutator (or axle), and causes it to turn around rapidly, in connection with an armature mounted between large field magnets. This rotation is directly applied by means of a belt or the like to the machinery. Where motors are applied to street cars . . . the motor (or motors) is usually placed beneath the car, while resistance-boxes, by means of which the motor-man controls it, are on either platform, and are operated by handles, much after the manner of a brake."

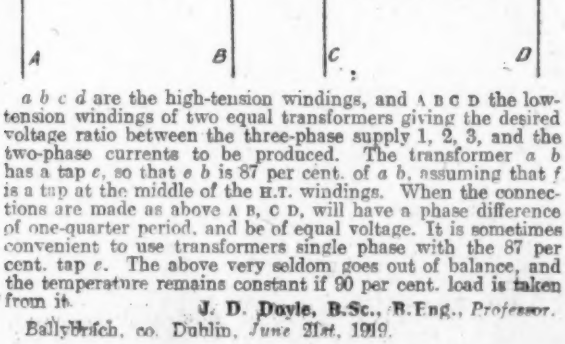
F. A. Swann, A.C.G.I., B.Sc., D.I.C.

London, S.E., *June 20th*, 1919.

Scott-connected Transformers.

Referring to the note on p. 731 of your last issue, Scott connections if properly made, and if great care is taken during balancing will operate most successfully. I have had considerable experience during my research on electrothermal chemistry in the conversion of three-phase to two-phase currents. I found I could get a very good balance, and the temperature rise in either of the transformers was nothing much to observe; however, I noticed the temperature rise highest in transformer *ab*.

I found the best load to operate at was 90 per cent. of the full rated load of the combined transformers. The following are my connections:—



a b c d are the high-tension windings, and A B C D the low-tension windings of two equal transformers giving the desired voltage ratio between the three-phase supply 1, 2, 3, and the two-phase currents to be produced. The transformer *a b* has a tap *e*, so that *e b* is 87 per cent. of *a b*, assuming that *f* is a tap at the middle of the H.T. windings. When the connections are made as above A B, C D, will have a phase difference of one-quarter period, and be of equal voltage. It is sometimes convenient to use transformers single phase with the 87 per cent. tap *e*. The above very seldom goes out of balance, and the temperature remains constant if 90 per cent. load is taken from it.

J. D. Doyle, B.Sc., B.Eng., *Professor.*

Ballybrack, co. Dublin, *June 21st*, 1919.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C.1.

14,578. "Methods of determining directions of signals in wireless telegraphy." J. G. STEWART. June 10th.
14,583. "Electro-therapeutic appliances." A. H. HEWITT. June 10th.
14,600. "Signalling apparatus." T. GOODYEAR & W. A. GOODYEAR. June 10th.
14,608. "Shade carriers for electric lampholders. V. HOPE. June 10th.
14,614. "Electric lampholders." V. HOPE. June 10th.
14,617. "Combined motor and dynamo with dual field control for starting and lighting sets for automobiles. E. J. HAWKINS. June 10th.
14,618. "Electric switch-device for securing railway-carriage doors." L. COLEMAN. June 10th.
14,622. "Switches for automatic and semi-automatic telephone systems." L. C. BYGRAVE. June 10th.
14,633. "Automatic and semi-automatic telephone systems." L. C BYGRAVE. June 10th.
14,668. "Dynamo electric machines and means for controlling operation thereof. L. J STEVENSON. June 10th. (U.S.A., June 20th, 1918.)
14,675. "Electric insulators." F. W. LETAIL. (Westinghouse Electric and Manufacturing Co.) June 10th.
14,678. "Sparking-plugs for internal-combustion engines." L. MOREL. June 10th. (France, June 10th, 1918.)
14,680. "Electric switches." R. L. MURRAY & TELEPHONE MANUFACTURING Co. June 10th.
14,682-3. "Apparatus for transforming electrical energy." J. E. CALVERLEY & W. E. HIGHFIELD. June 10th.
14,684. "Electrical engine-starting device." S. T. HENN & RUSHMORES, LTD. June 10th.
14,707. "Ignition and lighting current generators for internal-combustion engines." R. L. ASPDEN. June 11th.
14,731. "Device for locking steering-gear and switching off electric current from magnetos of motor cars, boats, aeroplanes, &c." G. CUMMUSKEY. June 11th.
14,732. "Electric theft or burglar alarm apparatus, &c." W. L. ELLIS. June 11th.
14,734. "Junction boxes for electrical conduits." A. W. SLATER. June 11th.
14,757. "Electric circuit connecting devices." J. GLASSON. June 11th.
14,758. "Oscillating-apparatus for submarine signalling, &c." SUBMARINE SIGNAL Co. June 11th.
14,760. "Electric insulators." H. LUTZ. June 11th.
14,761. "Suspension insulators." H. LUTZ. June 11th.
14,762. "Container for secondary cells." E. G. LIND. June 11th.
14,776. "Electrically heated laundry irons." F. ANGELL & H. ANGELL. June 11th.
14,782. "Means for preventing manipulation of electric motor-vehicles." H. CROCHAT. June 11th.
14,790-17,791. Magneto-electric machines." C. OLIVETTI. June 11th.
14,792. "Distributors for ignition apparatus." C. OLIVETTI. June 11th.
14,797. "Signalling devices." H. ASHWORTH, J. J. ASHWORTH & R. R. ASHWORTH. June 12th.
14,808. "Interlocking-devices for combined tumbler switches and sockets." J. H. COLLIE. June 12th.
14,809. "Fixing frame for securing electric meters switches, fuses, &c., to walls, &c." E. A. WELCH. June 12th.
14,818. "Sparking-plugs for internal-combustion engines." J. S. FOLEY. June 12th.
14,825. "Aerial systems for wireless telegraphy." C. T. WILKINSON. June 12th.
14,842. "Rotary rectifier of alternating current. A. D. MACROPOULOS (Macropulos). June 12th.
14,877. "Process for production of plates and sheets by electro-deposition." S. O. COWPER-COLES. June 12th.
14,879. "Electric furnaces." E. P. BARFIELD & L. W. WILD. June 12th.
14,909. "Trolley heads for overhead wire systems of electric traction." BRECKNELL, MUNRO & ROGERS & A. M. WILLIS. June 13th.
14,913. "Methods of converting supply of direct current from one voltage to another." AUTOMATIC TELEPHONE MANUFACTURING Co. June 13th.
14,919. "Air-cooled sparking plugs." L. PINESCHI. June 13th.
14,934. "Holders, contacts and sockets for wireless or vacuum tubes." W. J. POLYBLANK. June 13th.
14,940. "Magnetic or electromagnetic measuring, indicating, recording, &c., apparatus." L. R. GLEASON. June 13th.
14,941. "Sparking plugs." A. WATKINS. June 13th.
14,948. "Electric switches." R. P. MYERS. June 13th.
14,956. "Safety device or belt trap for electric lighting of trams." W. WOOD (Wood). June 13th.
14,963. "Distributors for ignition systems of internal-combustion engines." D. A. V. RIST. June 13th.
14,991-2. "Automatic telephone system." RELAY AUTOMATIC TELEPHONE MANUFACTURING Co. & F. M. WARD. June 13th.
14,993. "Automatic telephone systems." B. B. JOHNSON & RELAY AUTOMATIC TELEPHONE MANUFACTURING Co. June 13th.
14,994. "Receivers of wireless signals." E. E. FRANKIS. June 13th.
15,036. "Electric, &c., change letter signs." J. S. POWELL & R. V. WILLESFORD. June 14th.
15,047. "Induction coils." F. WEATHERILL. June 14th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

2,598. DEVICES FOR COUPLING CIRCUITS IN WIRELESS TELEGRAPHY AND TELEPHONY SO AS TO PRODUCE OSCILLATIONS HAVING A STRICTLY SINGLE FREQUENCY. E. Bellini. February 21st, 1916. (126,978.)

1917.

1,460. WIRELESS TELEPHONY.—Soc. Francaise Radio-Electrique. February 15th, 1916. (127,008.)

2,591. ELECTRIC DRIVING GEAR PARTICULARLY FOR MOTOR CARS. E. Crochat. December 15th, 1916. (Patent of addition not granted. (127,012.)

2,656. RECEIVING APPARATUS FOR WIRELESS TELEGRAPHY. L. N. Brilluoin & G. A. Beauvais. March 27th, 1916. (127,103.)

2,657. TELEPHONE INSTALLATIONS PARTICULARLY FOR WIRELESS TELEGRAPHY. L. N. Biriluoin & C. A. Beauvais. November 7th, 1916. (127,014.)

4,083. PROCESSES OF PRODUCING METALLISED BRUSHES FOR ELECTRIC MACHINES. Compagnie Générale Electrique. May 27th, 1916. (127,030.)

4,288. APPARATUS FOR THE ELECTRIC DRIVING OF SHIPS SUCH AS SUBMARINES. E. C. R. Marks. (Volta Soc. Anon.) March 24th, 1917. (127,042.)

19,313. GRINDING AND OTHER MACHINES HAVING MAGNETIC WORK HOLDERS. W. Arter. December 31st, 1917. (127,051.)

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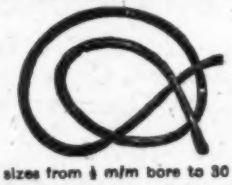

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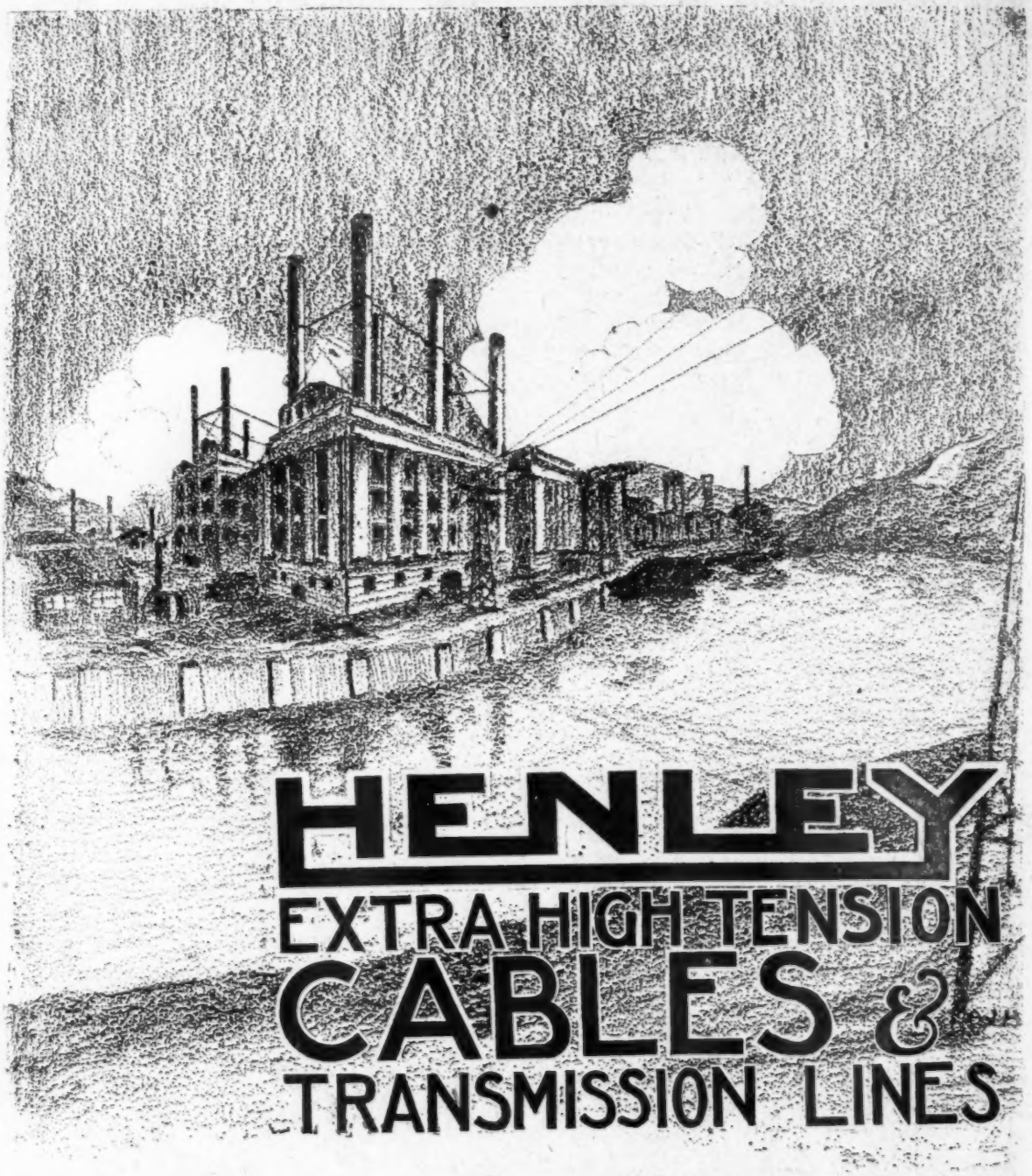

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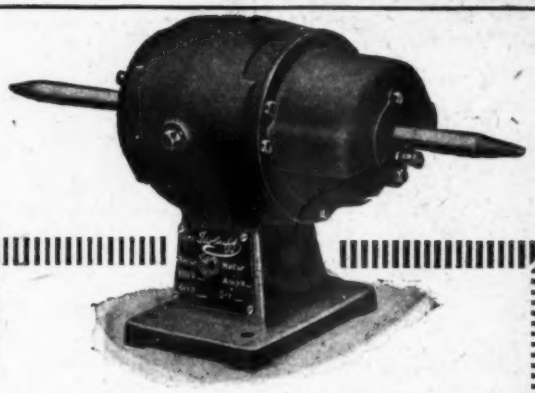

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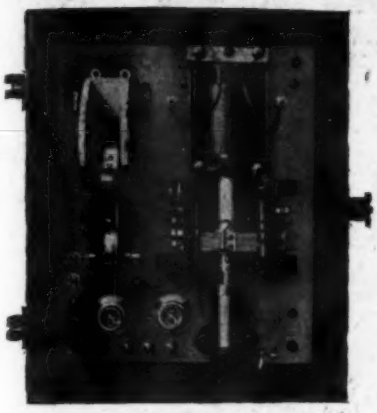

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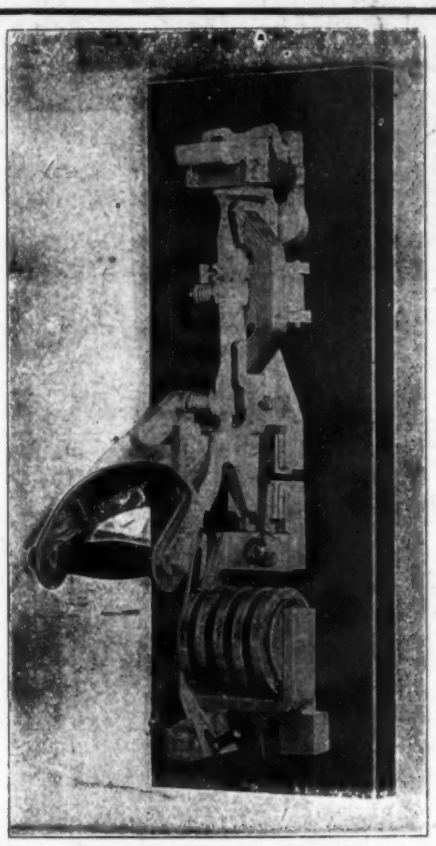

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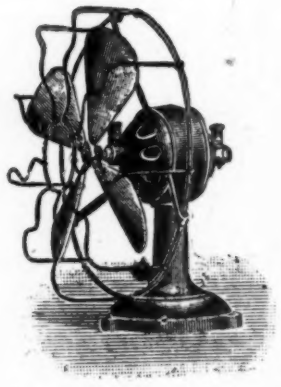

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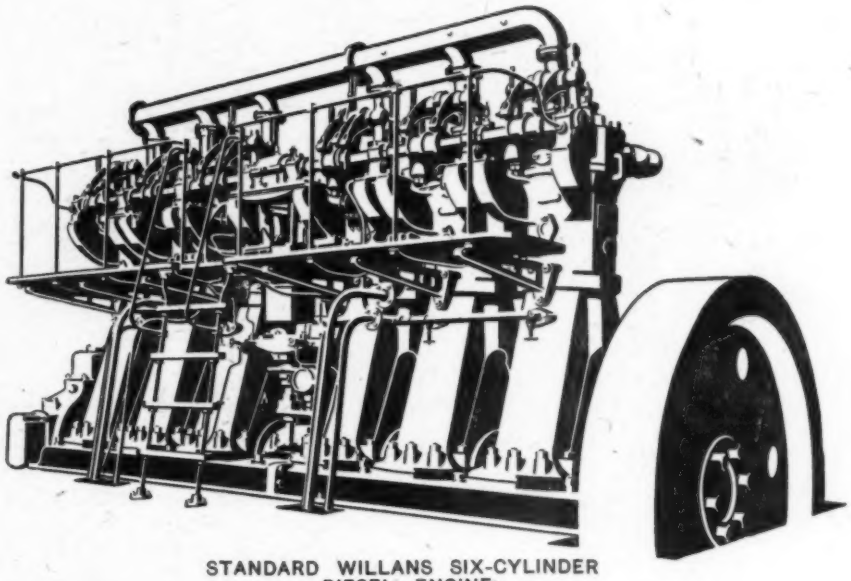

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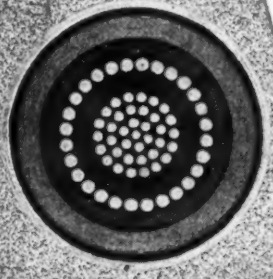

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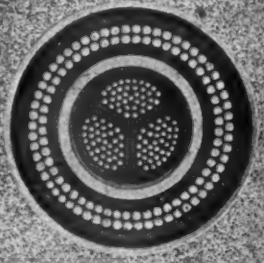

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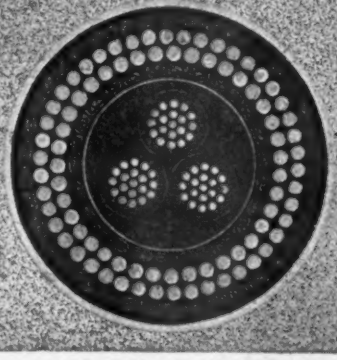

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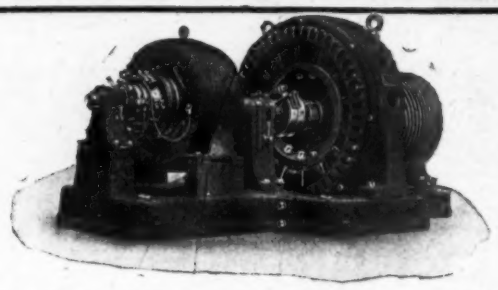

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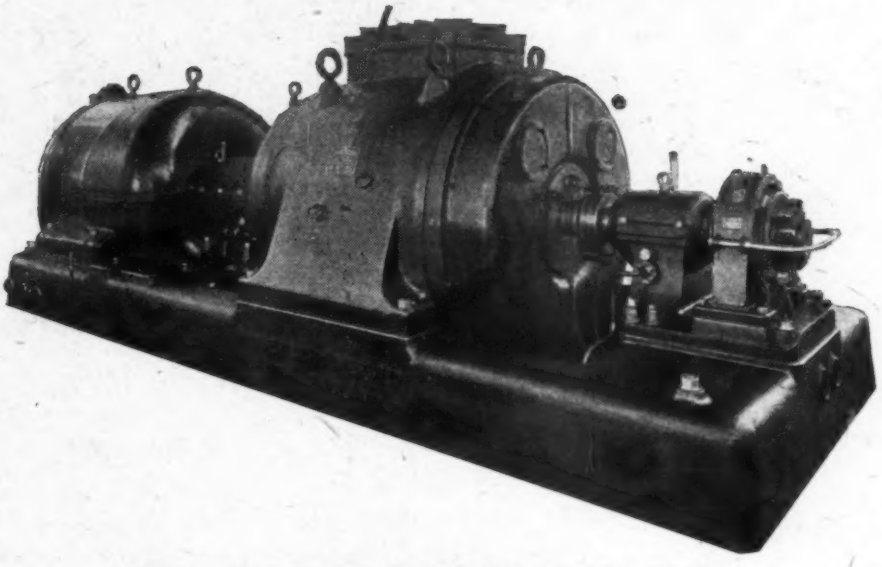

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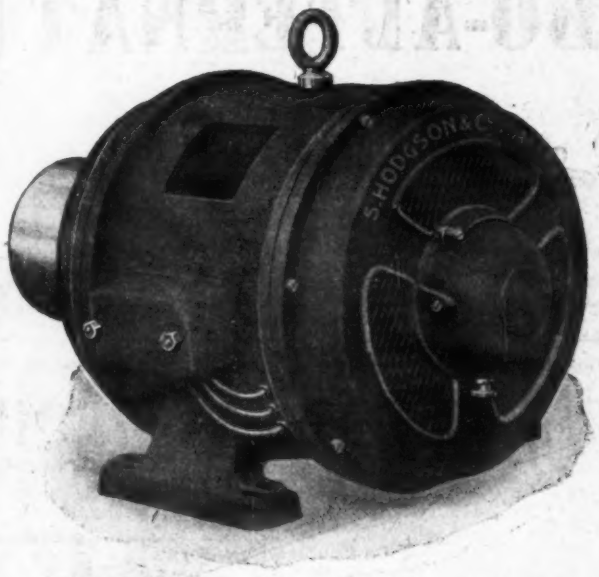

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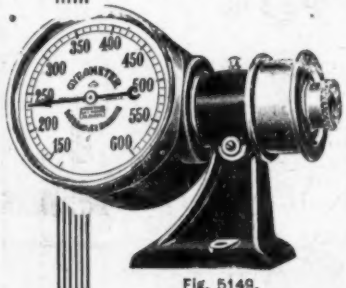

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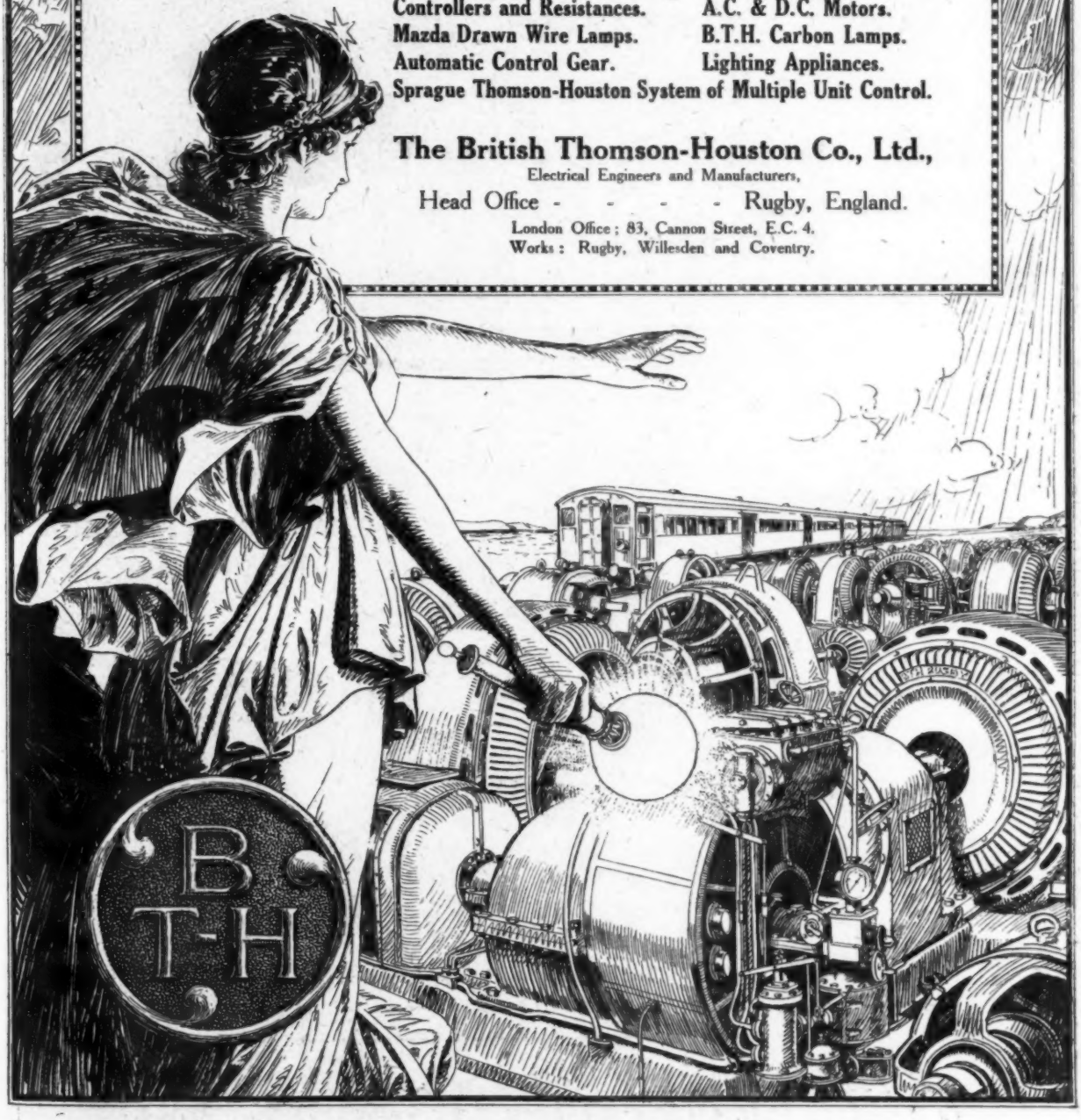

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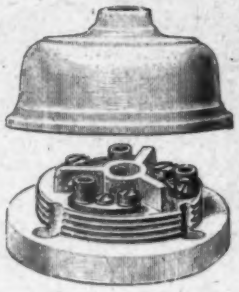

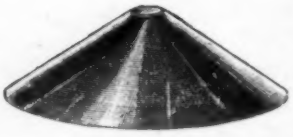

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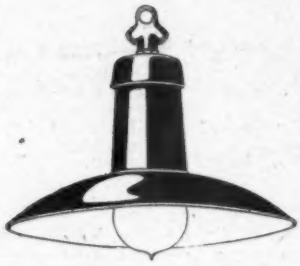

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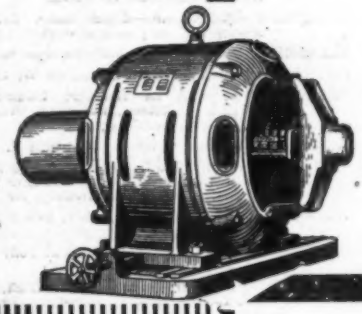

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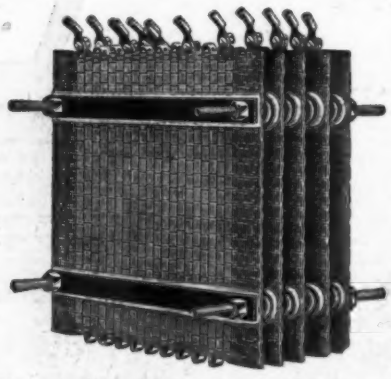

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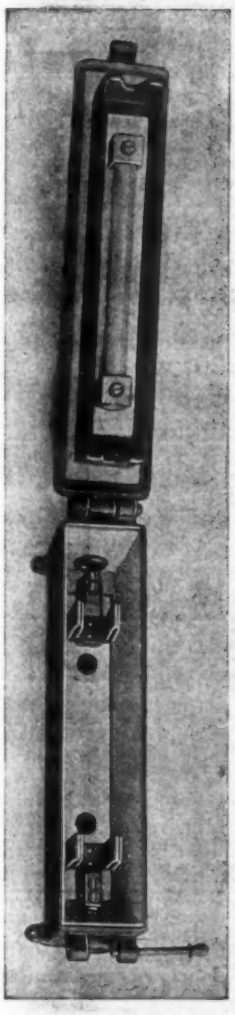

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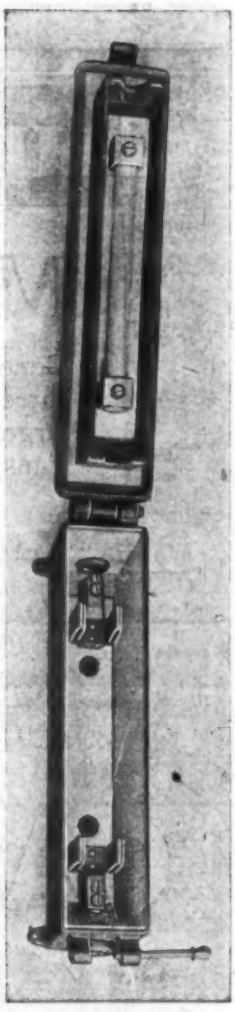

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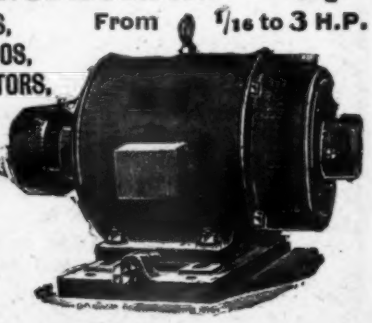

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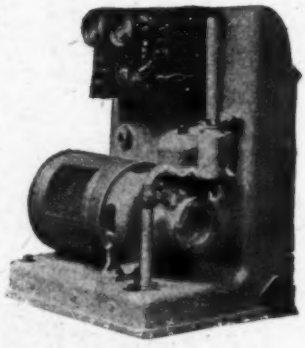

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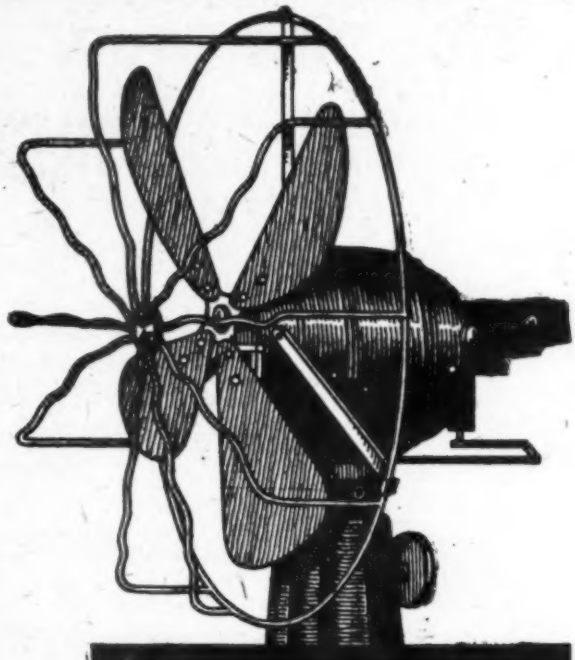

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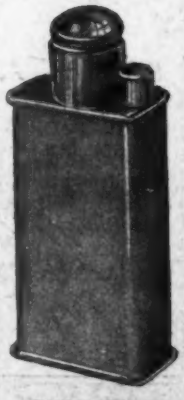

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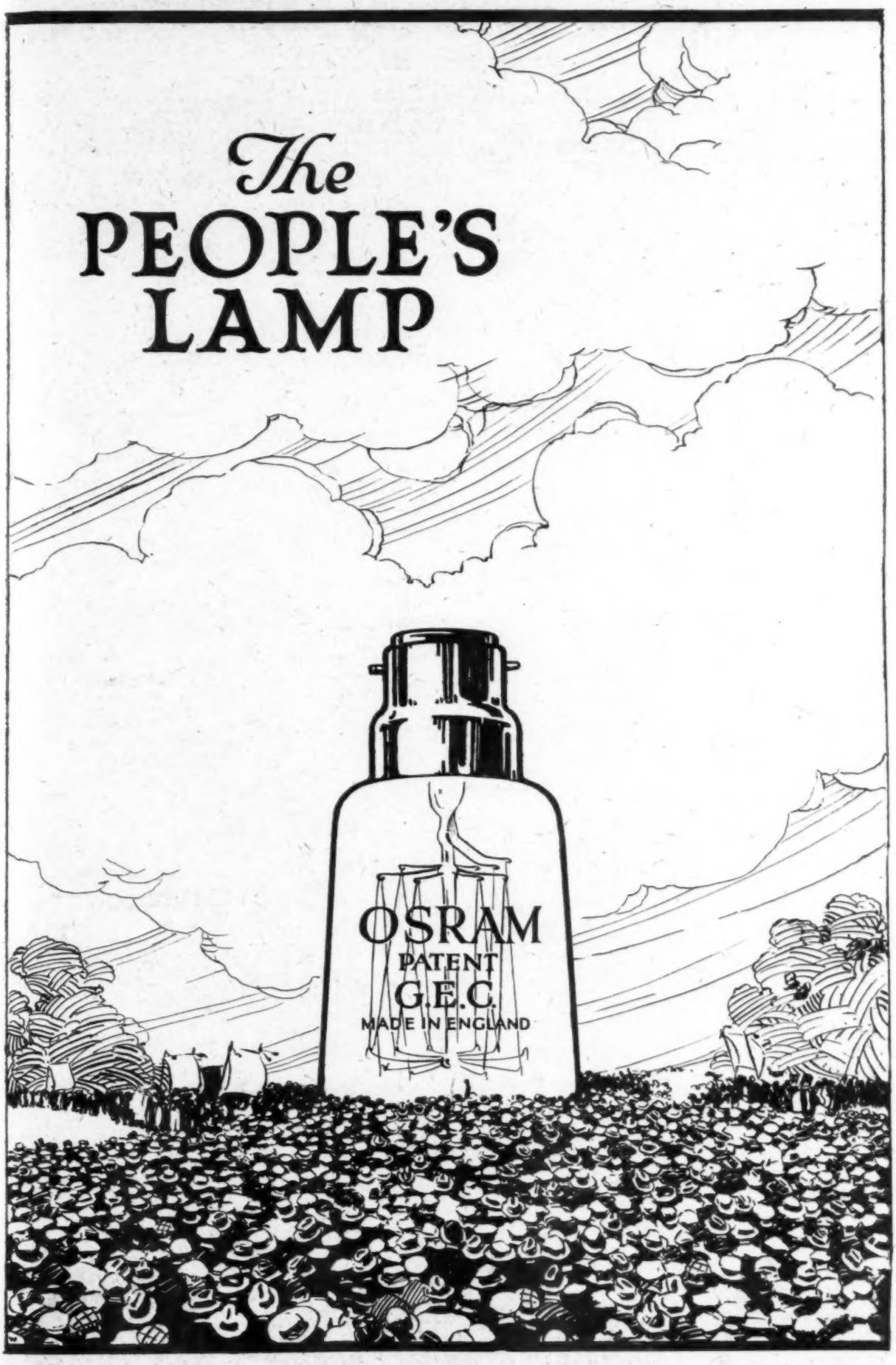

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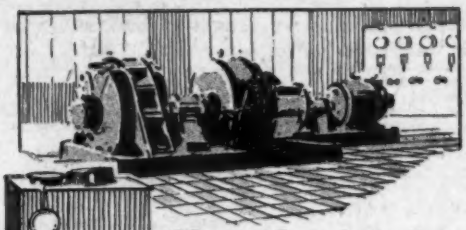

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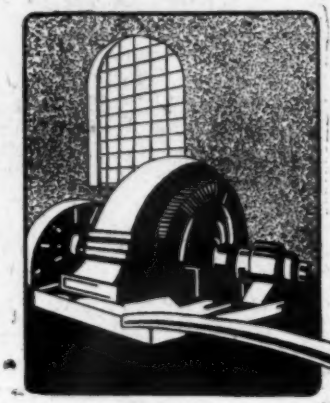

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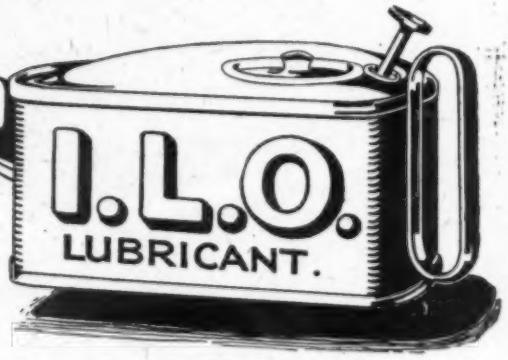

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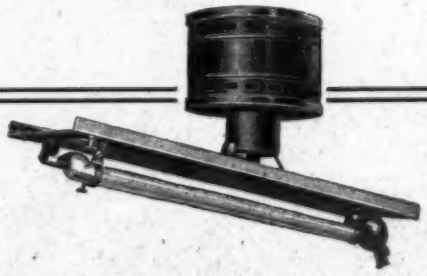

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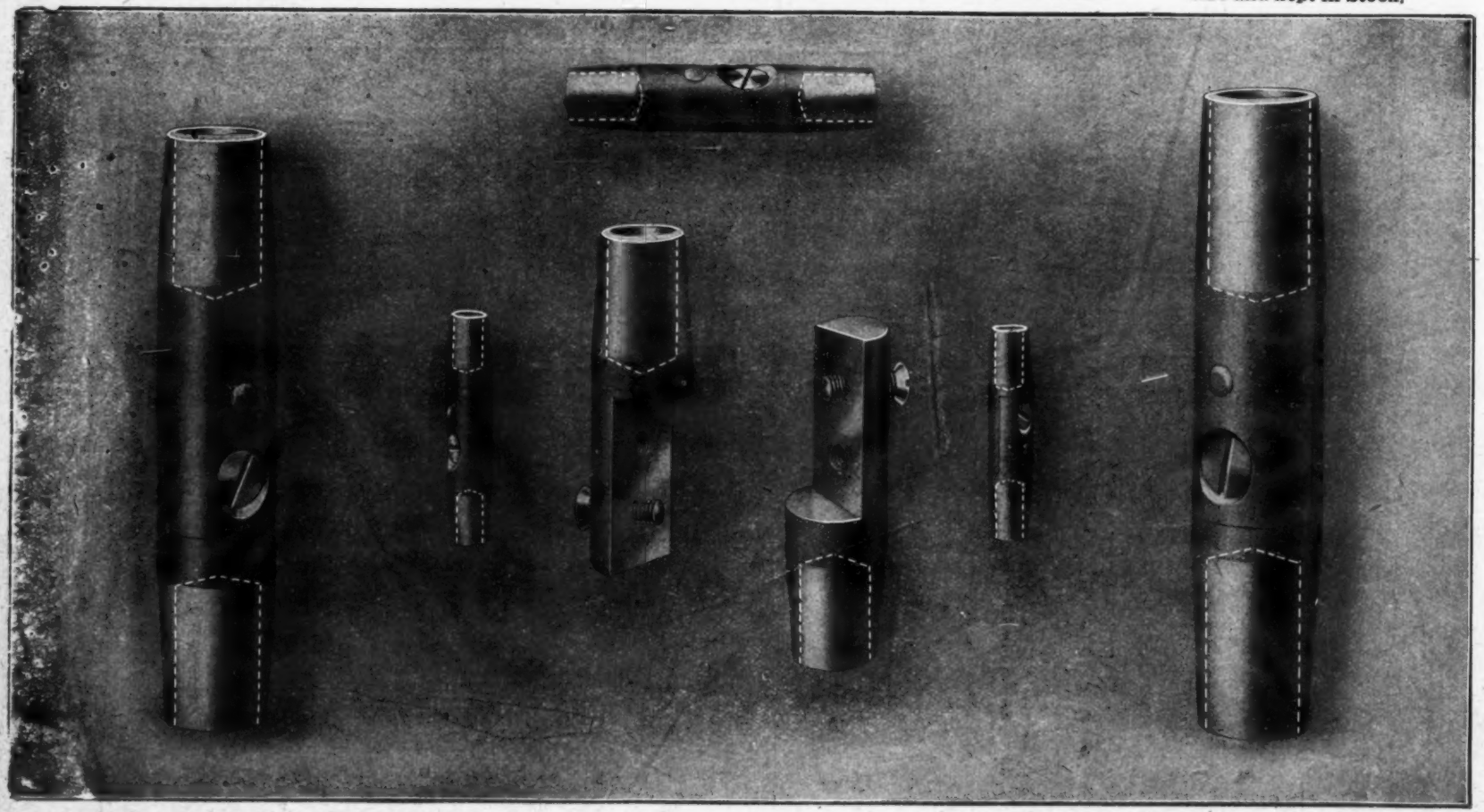

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Diameter of Cable Hole	¼″	5/16″	3/8″	7/16″	17/32″	⅝″	¾″	13/16″	1 1/16″	1 5/16″
Depth of Cable Hole	⅜″	⅜″	½″	⅝″	1 1/16″	1¼″	1½″	2″	2½″	2⅝″
Diameter of Largest Part of Body	5/8″	5/8″	7/8″	1 1/8″	1 3/8″	1⅝″	1¾″	1 15/16″	1⅞″	1⅞″
Length over all	1 1/16″	1⅛″	2⅛″	3½″	4 1/16″	4½″	5⅛″	6½″	8⅛″	9⅛″

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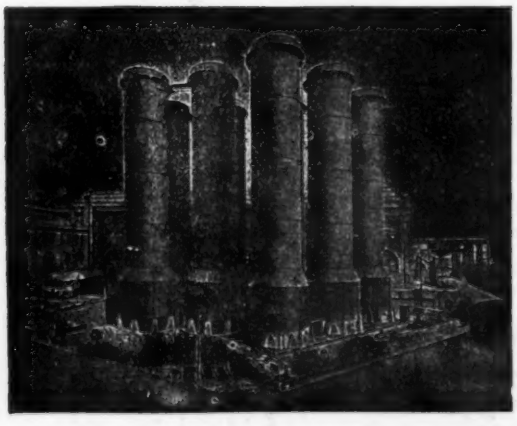

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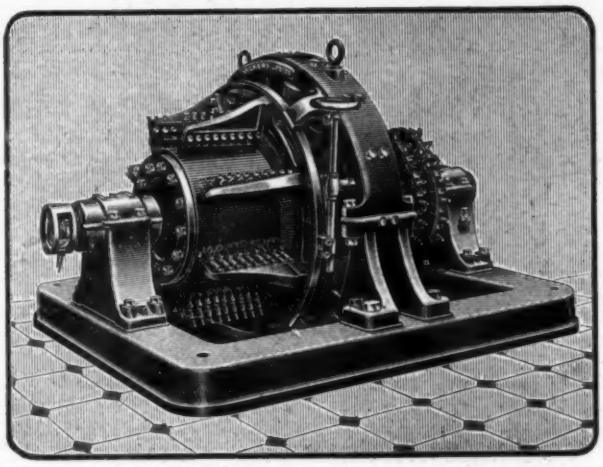

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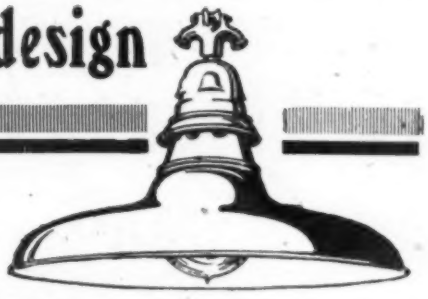

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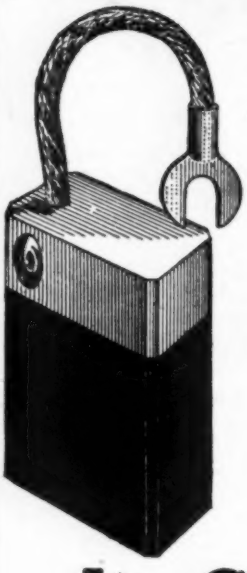

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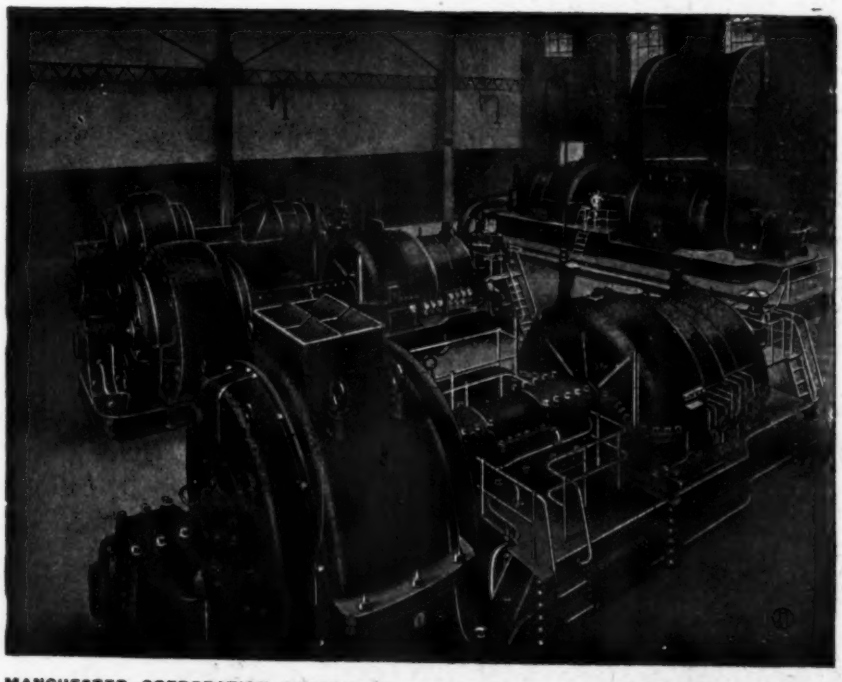

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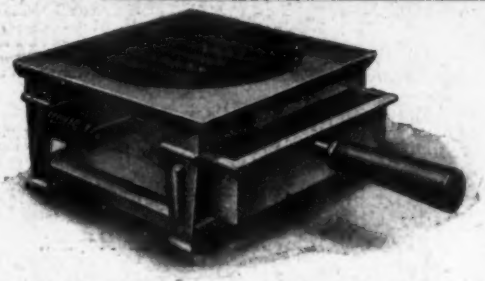

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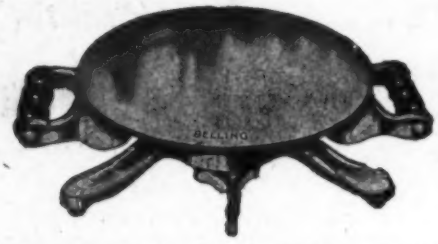

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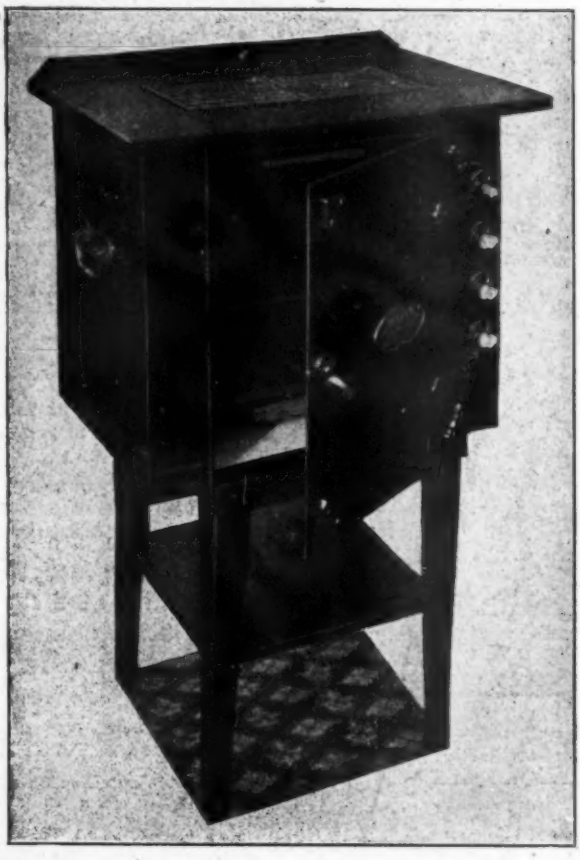

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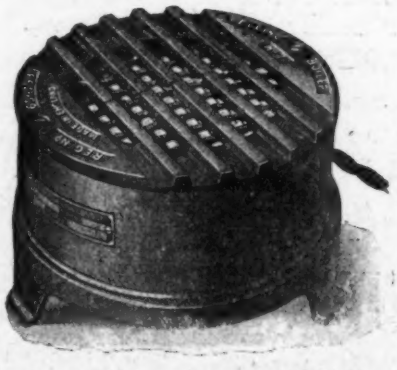

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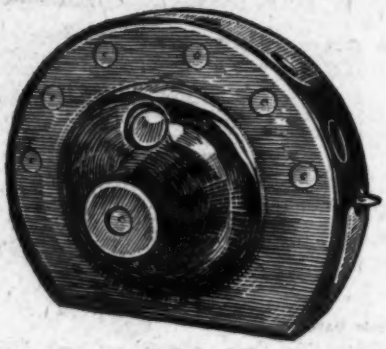

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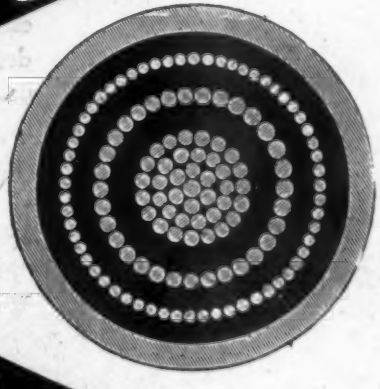

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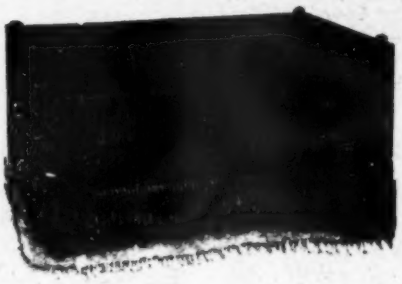

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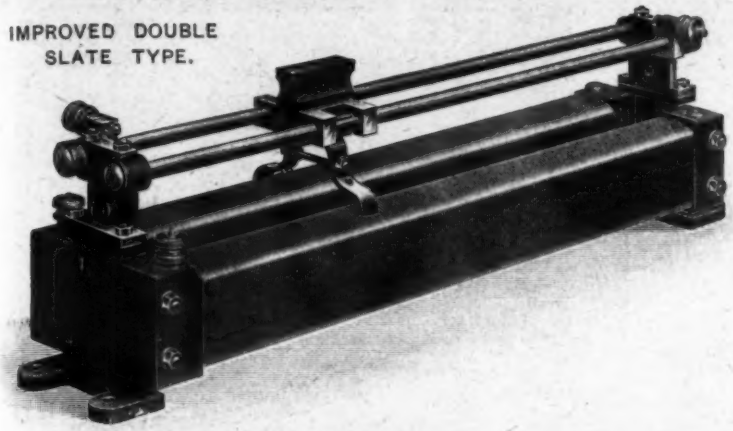

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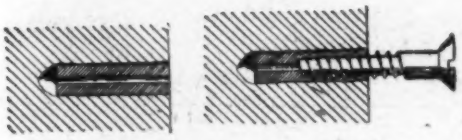

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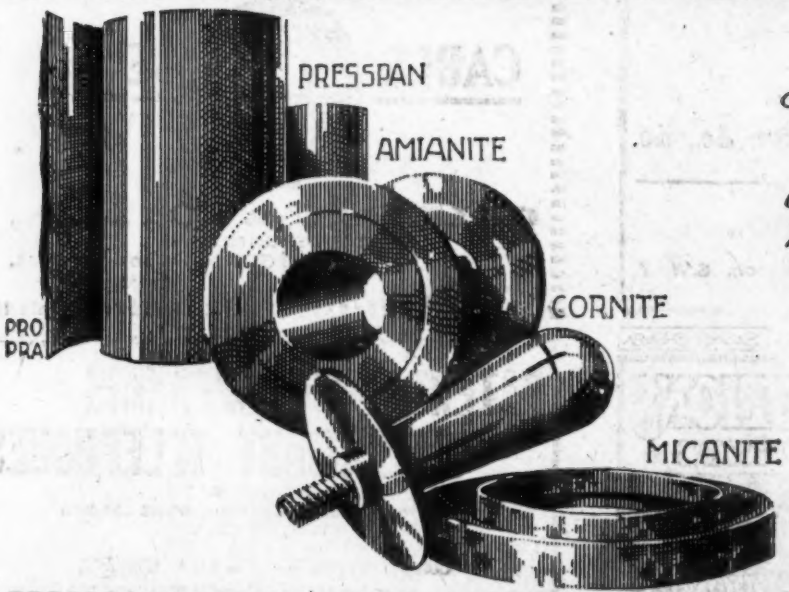

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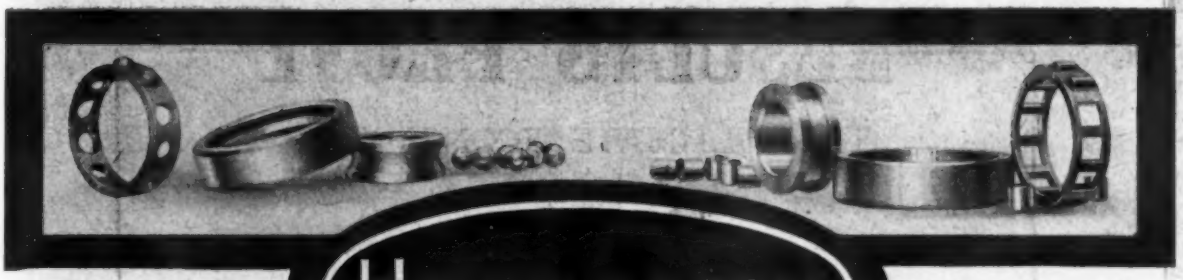

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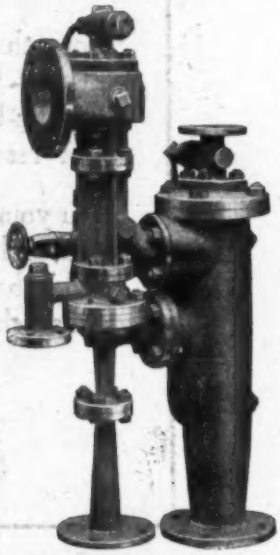


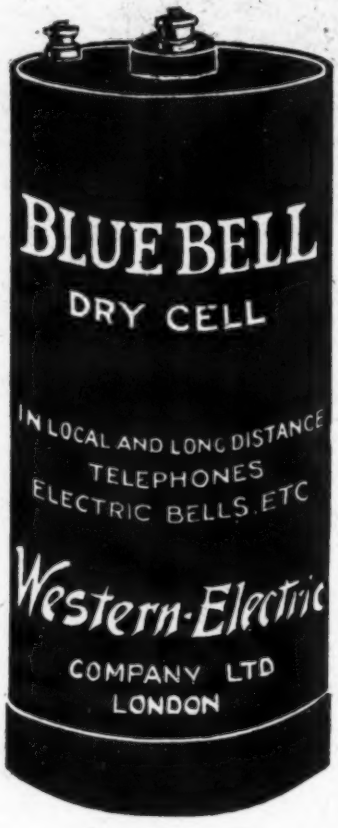
INTERMEDIATE CONDENSER TYPE.
For a 5,000-kw. plant the Intermediate Condenser Type weighs 200 lb. and uses 400 lb. of steam per hour.

THE MIRRLEES WATSON COMPANY LTD.

SPECIALISTS IN CONDENSING PLANT,
Head Office and Works: SCOTLAND STREET, GLASGOW.
London Office: 122, CANNON STREET, E.C. 4.

RESULTS PROVE

THE ULTIMATE ECONOMY OF



The most nourishing battery product that it is possible to buy.

Note that we say ultimate economy. You may "Save" a little at the time of buying ordinary batteries, but it is only "Make-believe." Poor batteries, no matter how cheap, bring poor results.

You yourself can only maintain health and strength on good food, and it is exactly the same with telephones. The Blue Bell Cell is the recognised telephone cell. In a word, they bring results, and so their price is justified : They mean ultimate economy.

IMMEDIATE DELIVERY.

CABLES
QUALITY
FIRST
TELEPHONES

Western Electric Company Limited

MANCHESTER, BIRMINGHAM, GLASGOW, LEEDS, SYDNEY, JOHANNESBURG, BUENOS AYRES.

He will bring your copy in a few days if—

your name appears among the thousands on our lists to whom we will be posting copies of our

NEW CATALOGUE

one day early next week.

The extraordinary demand for our Eleventh Edition not only shows how very urgently a complete and reliable Telephone Catalogue is needed, but it also shows the extent and value of the "Sterling" reputation, and the universal popularity of all Sterling Manufactures.

If you have not already applied for a copy of this new Edition (with 150 pages full of profitable information)

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Sterling Telephone & Electric Co., Ltd.,

TELEPHONE HOUSE,

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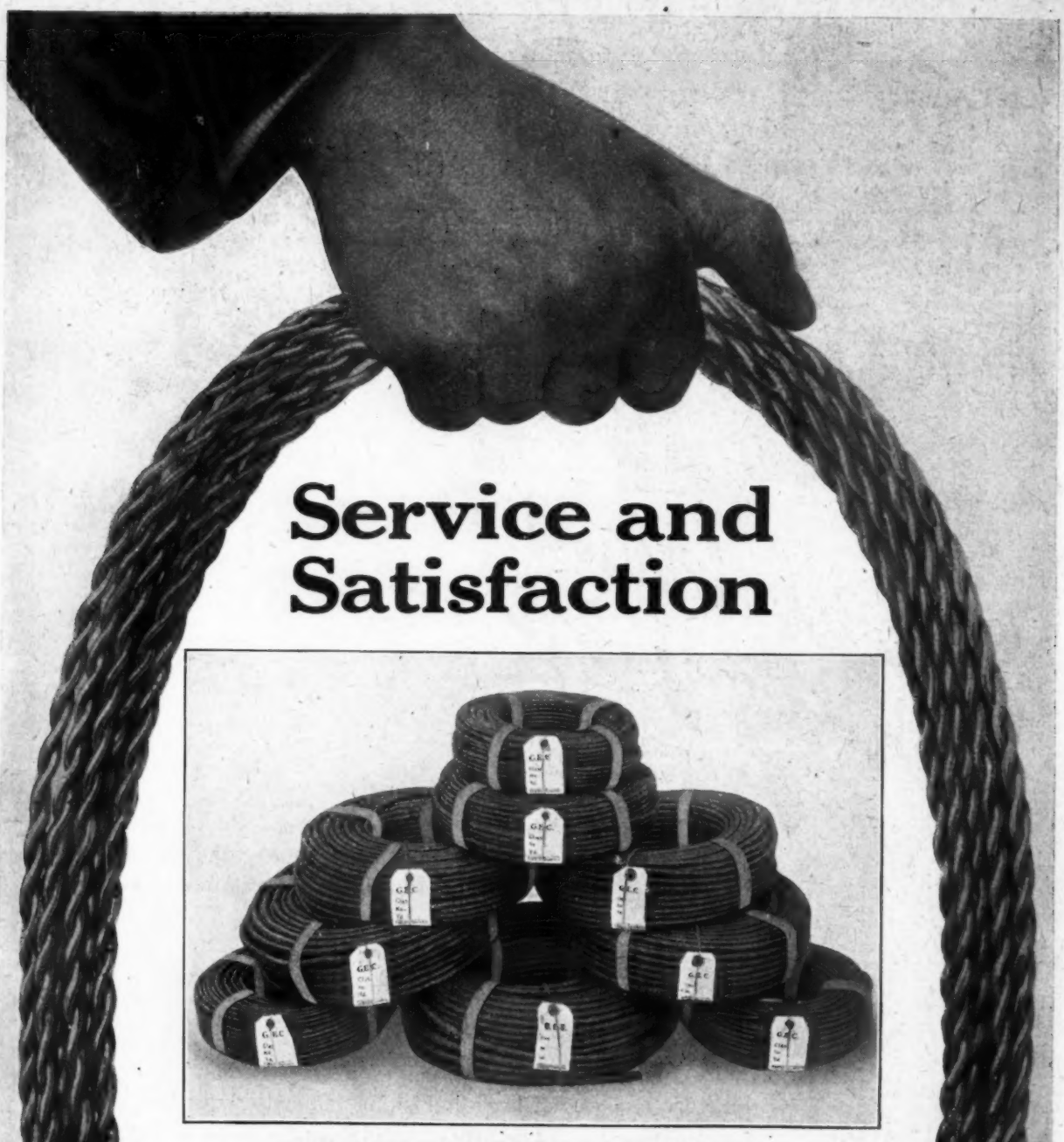
Telegrams: "Cucumis, Ox., London." *Telephone Nos. 4144 Museum (5 lines).*

WORKS: DAGENHAM, ESSEX. **NEWCASTLE-ON-TYNE: 42, Westgate Road.**



Service and Satisfaction

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LIGHTING FLEXIBLES

in a range which will meet all requirements.

THIN VULCANISED RUBBER, PURE RUBBER, DOUBLE VULCANISED "BEST" (PURE and VULCANISED RUBBER), Cotton, Silk or Workshop, and in a large variety of colours.

Special Quotations will be given for your requirements.

LARGE STOCKS. IMMEDIATE DELIVERIES!

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Head Office : **67, Queen Victoria St., London, E.C.**

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REGD TRADE MARK

SPECIAL NOTICE.

OFFICIAL NOTICES, PATENT NOTICES, SITUATIONS VACANT, SITUATIONS WANTED, PARTNERSHIPS, AGENCIES, ARTICLES FOR SALE, ARTICLES WANTED, ETC.

Latest Time 5 p.m. WEDNESDAY.

¶ New Copy and Alterations to Existing Trade Advertisements (with Blocks) should reach here

Not later than FRIDAY.

Unless otherwise instructed, **ALL LETTERS** received in answer to Advertisements with a Box number, **ARE FORWARDED NIGHTLY.** Postages incurred are charged at cost

LIMP CLOTH. 40 PAGES. POST FREE 1s. 6d.

THE CONDUCTOMETER AND ELECTRICAL CONDUCTIVITY.

By ROLLO APPLEYARD.

The ELECTRICAL REVIEW, Ltd., 4, Ludgate Hill, London, E.C. 4.

VALUERS

and AUCTIONEERS of

Electrical Works, Plant and Stock.

WHEATLEY KIRK, PRICE & CO.

(Established 1850).

46, Watling Street, London, E.C. 16, Albert Square, Manchester.

26, Collingwood Street, Newcastle-on-Tyne.

Re D. HULETT & CO., LTD., 55/56, HIGH HOLBORN, W.C. 2.

To Gas and Water Companies, Gas Fitters, Electricians, Ironmongers, Brass Finishers, Illumination Contractors, Machinery Dealers, &c.

HENRY BUTCHER & CO.

have received instructions

TO SELL BY AUCTION,

On Tuesday, July 8, 1919, and three following days,

commencing each day at 11 o'clock a.m. (precisely) the whole of the Valuable and Extensive

Stock-in-Trade, Plant, Machinery, Fixtures and Fittings

of a WHOLESALE GAS ENGINEER, ELECTRICIAN and PLUMBERS' MERCHANT, including in the

Electric Department.—20 miles Wires and Cables; Pendants; Brackets; Lampholders; M.F. Lamps; Switches; Fuse Boxes; Ceiling Roses; Capping and Casing; Simplex Tubes and Fittings; Enamelled Shades; Leclanché Batteries; Silk Cord Flex; Flash Lamps; "Ever-ready" Batteries; Electric Bells.

Illumination Department.—25,000 Gas and Candle Bucket Lamps: Crystal, wrought-iron, copper, transparent Illumination Devices; 500 gross Lustre Studs, Drops, Dishes and Arm Pans in clear and coloured glass, &c., &c.

The whole of the Stock will be sold in large trade lots.

On view Friday, Saturday and Monday preceding and mornings of sale.

Full particulars and Catalogues from Messrs. FOSTER, SPICER AND FOSTER, Solicitors, 7, Queen Street Place, Cannon Street, E.C. 4: also of Messrs. HENRY BUTCHER & CO., Engineers' Valuers and Auctioneers, 63 and 64, Chancery Lane, London, W.C. 2. 'Phone: Holborn 2295.

NOTE.—On account of the large number of lots, the sale will commence on TUESDAY, JULY 8th, 1919, and continue for the three following days, commencing at 11 o'clock each day precisely.

5623

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Wednesday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

ELECTRICAL MECHANIC.

ELECTRICAL MECHANIC required by the Government of Somaliland for a tour of 12 months, with possible extension. Salary £250, rising by annual increments of £10, to £300 per annum, and a war bonus at present in force of £50 per annum. Free passages out and home. Government quarters free of rent. Candidates, unmarried, between the ages of 25 and 35, who possess the following qualifications:—

(1) Good general electrical knowledge.
(2) Ability to maintain accumulators and plant.
(3) Knowledge of high-speed oil and petrol engines.
(4) General mechanical knowledge, including lathe work, metal working and small woodwork.
(5) Knowledge of radio frequency apparatus.

Should apply at once by letter, giving particulars as to age and experience, to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, S.W. 1, quoting M8199. 5668

THE BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION.

Appointment of Director of Research.

THE COMMITTEE OF MANAGEMENT of the above Association invite applications for the post of Director of Research, at a salary that will depend upon the qualifications of the successful candidate, but that will not be less than £1,250, and may considerably exceed that sum.

Applications must be received on or before 21st JULY, 1919.

Forms of application and all information may be obtained from—

THE SECRETARY,
British Cotton Industry Research Association,
108, Deansgate, Manchester. 5667

CABLE JOINTER.

WANTED, thoroughly experienced Cable Jointer on E.H.T. and L.T. mains, capable of plumbing his own work.

Wages, including all bonuses £4 2s. 8d. per week (standing wage).

Applications, giving full particulars of experience and references, to— ELECTRICAL ENGINEER,
Burnley. 5712

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ROYAL SIAMESE STATE RAILWAYS.

APPLICATIONS are invited for the position of Electrical Foreman to the above Railways.

Candidates should have good, all-round electrical training; be capable of taking charge of the complete electrical equipment of railway workshops, using direct-current, and preferably be familiar with the care and maintenance of Stone's electric train lighting system, though the latter is not essential.

The engagement will be for three years, in the first instance, at 350 ticals per month for the first year; 375 ticals per month second year, and 400 ticals per month third year.

13 ticals = £1, approximately.

Apply by letter, stating age, married or single, and when at liberty, and giving full particulars of education, training, and experience, to—

MESSRS. C. P. SANDBERG,
70, Victoria Street, S.W. 1. 5722

ROYAL SIAMESE STATE RAILWAYS.

APPLICATIONS are invited for the position of Chief Draughtsman to the above Railways.

Candidates should have had a good general and technical education, have served their time as mechanical engineers, and had subsequent experience in the design and construction of railway carriages and wagons. Knowledge of locomotive design and general engineering is also necessary.

The engagement will be for three years in the first instance, at a salary of 300 ticals per month for the first year; 320 ticals per month for second year; and 340 ticals per month for third year, with usual field allowances. 13 ticals = £1 approximately.

Apply by letter, stating age, married or single, and when at liberty, and giving full particulars of education, training, and experience, to—

MESSRS. C. P. SANDBERG,
70, Victoria Street, S.W. 1. 5721

BIRMINGHAM MUNICIPAL TECHNICAL SCHOOL.

APPLICATIONS are invited for the following Lectureships. In addition to the salary indicated there is at the present time a war allowance of £78 per annum.

1. Physics	Salary	£250 to £380
2. Electrical Engineering ...	,,	£250 to £380
3. Mechanical Engineering ...	,,	£250 to £450

The commencing salary will be dependent upon the experience of the applicant. Full particulars may be obtained on application to the SECRETARY, Municipal Technical School, Suffolk Street, Birmingham. 5692

OVERHEAD LINESMAN.

VACANCY for experienced Tramway Overhead Linesman, standard district rates and conditions. Permanency. Applications to—

ENGINEER AND MANAGER,
Erith Council Tramways,
Walnut Tree Road,
Erith,
Kent. 5734

PLUMBERS-JOINTERS.

SEVERAL good men required, thoroughly experienced, on E.H.T. work. Wages, including war bonus, £4 2s. 6d. per week of 47 hours, plus a liberal out-allowance for expenses. Applications, giving full particulars of experience and references, to—

5646, ELECTRICAL REVIEW,
4, Ludgate Hill, London, E.C. 4.

WIREMEN WANTED.

PERMANENCY to right men; wages £3 11s. 11d. per 47-hour week, including all bonuses to date. Supply undertaking in the Midlands.

Apply, stating age and experience, to—

5611, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

ELECTRICAL INSTRUMENTS.

REQUIRED CHIEF OF DEPARTMENT. Must be capable of designing and estimating for all classes of moving coil and moving iron instruments (switchboard, portable and industrial), galvo's, &c. Able to fix labour prices, good organiser of labour, both in test room and factory.—Apply, giving full particulars of experience, salary, and when available, to 5654, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

SITUATIONS VACANT.—*Continued.*

BOROUGH OF BACUP.

Electricity Department.

WANTED, first-class Jointer, used to E.H.T., 6000 volts and L.T. paper cables; able to do own plumbing and work on live mains.

Applications, stating age, previous experience, together with recent testimonials, and when at liberty.

The above appointment is a temporary one with possible permanency. District rate of wages paid. 48 hours per week.

JAMES F. MURDOCH,
Electrical Engineer.

50, Market Street,
Bacup. 5669

SUB-STATION ATTENDANT.

THE METROPOLITAN BOROUGH OF HACKNEY requires the services of a good Engineer Attendant experienced with converting plant and three-wire D.C. distribution. Salary, inclusive, £4 8s. 3d., 48-hour week.

Applications by letter, full experience, training, age, &c., to BOROUGH ELECTRICAL ENGINEER, 306, Mare Street, Hackney, E 8. 5723

JOINTER.

JOINTER wanted; must be capable of jointing V.B. Cables and laying Services and Mains on solid system. Wages 70s. per week of 47 hours, including all awards.

Apply, stating age and experience, with copies of recent testimonials, to the CHIEF ENGINEER, Electricity Works, Luton, Beds. 5675

BURGH OF AYR.

CABLE JOINTER Wanted for high and low-tension, paper-insulated, lead-covered and armoured, concentric cables. Wages, including war bonus, £3 10s. per week of 48 hours.

Applications, with age and experience, copies of testimonials, and date when duties can be commenced, to THE MANAGER, Electricity Works, Ayr, Scotland. 5557

LEITH CORPORATION ELECTRICITY DEPARTMENT.

JOINTER for Lead-covered, triple concentric Paper Cable system; own plumbing, and experience essential. Total wage £4 1s. for 48-hour week.

Electricity Works, Leith. 5706

ELECTRIC WIREMAN.

ELECTRIC WIREMAN required, accustomed to good-class house work. Union rates and conditions.

Full particulars and references to H. FARADAY PROCTOR, Chief Engineer & General Manager, Corporation Electricity Department, Bristol. 5674

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ARMATURE Winder.—A practical man wanted as foreman armature winder for repair works in the Midlands. Must be experienced on all types and sizes of A.C. and D.C. winding and capable of making his own coil-winding jigs and formers by up-to-date methods. Applicants should give full particulars of their experience, enclosing copies of testimonials, stating age and salary required.—5683, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARMATURE Winder required by firm in Midlands manufacturing small motors, both A.C. and D.C.—5525, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARMATURE Winders used to A.C. and D.C. work; standard rate paid, plus 12½% bonus; none but first-class men wanted.—Apply Dick, Kerr & Co., Preston. 5606

ARMATURE Winders wanted, experienced A.C. and D.C.; not repetition work.—Westminster Engineering Co., Ltd., Willesden Junction, N.W. 5745

ARMATURE Winders wanted, skilled men A.C. and D.C. repairs. Fare paid. Permanent employment. State experience.—McWhirter & Sons, Ltd., Cardiff. 5655

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ASSISTANT Engineer required immediately for contract department of engineering firm in Midlands. Steam turbine and electrical plant experience essential. State qualifications age and salary expected.—5550, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Manager for small works (Midland), experienced bench and lathe. Make drawings, calculations and push work. Thorough crane and motor experience.—State salary, experience, to 8681, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT wanted by electrical engineering firm near London. Must have experience in transformer design. State age, salary required and details of experience.—Apply by letter to 5700, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CABLE Foreman, accustomed to heavy power cable work and duct laying; must be good man on street work, trenching and timbering. Permanent position for capable man.—Applications, giving age, full particulars and length of experience, references, and stating wages and expenses required, to 5645, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CLERK wanted for inwards order department of electrical engineering factory. Experience desirable. Commercial and semi-technical.—Write full particulars, age, experience, salary, to Igranic Electric Co., Ltd., Bedford. 8796

DESIGNER, electrical, required, experienced in design of small A.C. motors, fans, portable drilling machines necessary. Give full particulars of experience, and state age and salary required.—5657, ELECTRICAL REVIEW 4, Ludgate Hill, London.

DRAUGHTSMAN required for transformer work, with large firm in London district. Salary paid according to experience. —Apply in writing, stating full particulars and salary required, to 5652, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN required with experience in design and construction of small dynamos, motors, and automatic switchgear.—Write, stating age, experience and salary required, to 5617, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN used to automatic machines or jigs.—State age, experience and salary required, to 5684, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN with experience of cable and winding machinery for designing and lay-out of plant. Good position for really capable man.—Apply, stating age, salary and references, and when could be at liberty, 5686, ELECTRICAL REVIEW, 4, Ludgate HILL, London.

DRAUGHTSMEN.—Transformer Draughtsmen required for single and three-phase Power Transformers in large manufacturing firm.—Apply, stating age, experience and salary required, to 5697, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Wireman wanted, with experience in motors, generators and plant work.—Apply Colston & Co., Oxford. 8849

ELECTRICIANS wanted, energetic and capable men, thoroughly conversant with A.C. and D.C. motors and equipment; also country house work, oil and gas engines, battery erection, good with casing and conduit; able to take charge, and lay out work if required.—References and full particulars to 8822, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIANS wanted, men with experience of warship work preferred. Steady employment for good workmen.—Apply Scotts' Shipbuilding and Engineering Co., Ltd., Greenock. 8560

ESTIMATING Engineer.—Wanted for India by a firm of electrical engineers and contractors, a capable Estimating Engineer with experience in design and arrangements of A.C. and D.C. high and low tension power and lighting equipment of modern mills and collieries; must be capable of laying out and estimating in detail for large power and lighting plant, mains, distribution, &c. Must be unmarried, not over 35 years of age. Five years' agreement.—Write, stating salary required, experience, names of references, to Z. M. 777, c/o Deacon's Advertising Offices, 7, Leadenhall Street, London, E.C. 3. 8833

EXPERIENCED Foreman or Forewoman required to take charge of flashing and mounting department, carbon filaments.—9728, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FITTER required for power station, accustomed to engines and general repairs; permanency to suitable man.—Apply, with references, stating age, salary required, and giving full particulars of experience, to the Rhondda Tramways Co., Ltd., Rheola Road, Porth, Glam. 8714

IMPROVER wanted for electrical instrument work. Testing experience essential.—8800, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

JOINTER required. One used to services and all classes of E.H.T. and L.T. mains work. Permanency to suitable man.—Apply, giving age experience and enclosing copies of testimonials, to Northampton Electric Light & Power Co., Ltd., 25, Bridge Street, Northampton. 5546

JUNIOR Draughtsman one accustomed to small induction motor designs preferred.—Reply, stating full particulars and salary required, Horace Green & Co, Cononley. 5736

MANUFACTURER of Carbon Electrodes requires Manager with sound technical and practical knowledge of Graphitising. —Apply in first instance, 5688, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

METER Tester wanted, who can also do small repairs to the ordinary standard forms of meters and slot meters.—Apply, giving experience and stating wages required, to 5741, ELECTRICAL REVIEW, 4, Ludgate Hill, London

OFFICE Salesman required for accessories department. Good man, able to handle correspondence and act with ability and enterprise on his own initiative; experience in buying and selling essential.—Apply, giving full particulars and salary required, to S. G. Leach & Co, Ltd, 26/30, Artillery Lane, E.C. 8866

PLUMBER-Jointer required by Corporation in Scotland; lead covered, paper insulated cables, E.H.T. and L.T. distribution. —Apply, stating age, experience, &c., to 5587, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLUMBER-Jointers wanted, must have had extensive experience in E.H.T. and L.T. work, and be used to jointing on live L.T. networks. Union rate, plus all war advances. 47-hour week.—5632, ELECTRICAL REVIEW, 4, Ludgate Hill, London

PUBLICITY Engineer required in London, whose principal duty will be to prepare advertisements of motor control gear for the technical press. Applicant must also be capable of assisting in estimating and commercial engineering department. Salary £4 to £5 per week inclusive, according to experience.—Give particulars of age, training and similar experience, 8754, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REPRESENTATIVE for London and the South of England, by Manchester firm of engineers, manufacturing well-known specialities relating to the economical production and utilisation of steam, in electric power stations and industrial works generally. Applicant must be a thoroughly trained engineer, and preferably with some commercial experience. Nominal salary plus commission on orders obtained.—Apply, stating age, qualifications and experience, to 5735, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED immediately, experienced Mains Engineer, for abroad. A really good post is offered, and none but those thoroughly experienced in maintenance of large systems of E.H.T. and low tension cables, rapid and accurate fault location and responsible office work, need apply.—5691, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SALES Engineer wanted for works sales department of an electrical manufacturing firm. Must have had experience in estimating and drafting tenders. Real live man wanted, of proved ability and progressive ideas.—Apply, stating experience and salary, to 5731, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SALESWOMAN for Electrical Showroom wanted.—State qualifications, experience and salary required, to 8817, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TELEPHONE Engineer wanted, with drawing office experience on equipment work.—Apply, stating age, full details of experience and salary required, to Telephone Works, Beeston, Notts. 5709

TELEPHONE Foreman required to supervise complete installation of underground lead covered telephone cables. Only first-class practical man need apply. Salary £4 per week with bonus and allowances.—Give full details of experience and present position.—5574, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TEST-room Assistant wanted for Glasgow. One having experience in moving coil and moving iron instruments preferred. Salary according to experience.—5725, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRANSFORMER Designer wanted, conversant with electrical and mechanical design. Only experienced applicants considered.—Apply, stating age, experience and salary required, to 5533, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRANSFORMER Draughtsman required for development and handling of current and potential transformer designs by large manufacturing firm. Permanency.—Applications invited from qualified men, who should state age, experience (in full) and salary required, to 5532, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

WANTED, an up-to-date Representative with a thorough knowledge of electrical accessories and fittings with a proved connection in London and South Coast by an enterprising firm of manufacturers; only those whose experience and connections answer the above requirements are asked to reply, as the position offered is an important and remunerative one. Applications will be treated with strict confidence by principals only.—5689, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Armature Winder, must be thoroughly competent and accustomed to D.K. 25A traction motors. Wages 1s. 10d. per hour.—Apply, with full particulars, to Electrical Engineer and Tramways Manager, Car Depôt, Bexleyheath, Kent. 5694

WANTED, Assistant Engineer for D.C. electric supply works, will be required to assist in carrying out repairs, must be conversant with high-speed engines and the efficient handling of B. & W. chain-grate furnaces. Salary £190 per annum.—5738, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, at once, experienced Armature Winders. Must be used to heavy A.C. and D.C. work. District rate of wages and piecework. Midland district.—5526, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, by large firm of electrical manufacturers in the Midlands, an Assistant Sales Engineer for Glasgow and West of Scotland, to represent them in the sale of Plant and Switchgear. Applicants should have some experience of the district.—Apply, stating experience and salary expected, 5679, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electrical Fitter accustomed to carry out small repairs to controllers, circuit breakers and the usual electrical equipment on tramcars.—Apply, stating experience and wages required, to 5742, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electrician, good all-round man for high-class work. Must have thorough knowledge of all branches.—8824, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, first-class Engineer, used to the repair and maintenance of the electrical equipment of a large factory, including power and lighting plant, telephones, &c., &c. The man must be a thoroughly sound technical man, conversant with the regulations of insurance companies, and able to control a staff of skilled workmen.—State age, experience and salary required, 5673, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, first-class Wiremen; experience of plant installations essential. — Apply by letter, stating qualifications and wages required, to J. T. Lowke & Sons, Central Works, Northampton. 5677

WANTED for Shipbuilding establishment in Birkenhead, Electrical Wiremen for ship work. Rate 68s. 6d. plus 12½ per cent.—5696, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Foreman, used to small A.C. and D.C. windings. Capable of taking full control of female labour working on a piece-work basis. Only first-class experienced men need apply. Permanency given to good man. Midland district.—Reply, stating age, experience and salary required, to 5527, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, good Man for first-class motor repairs, rewinds, &c. —Send full particulars, age, experience and wages required, 8637, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED immediately, a first-class Electrician, to take charge of a large Colliery electrically equipped throughout. Good experience in A.C. and D.C. work essential. Wages £6 6s. per week, with house, coal and light.—State age and experience, 5707, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED immediately, 3 or 4 first-class Wiremen (E.T.U.) for country house installation work near Belfast.—Apply Wm. Coates & Son, Ltd., Electrical Engineers, Coates Buildings, Belfast. 5695

WANTED, Mechanician used to pivoting and suspending sensitive moving-coil instruments.—Apply, stating details of experience, age and wages required, to 5708, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, three competent Electricians, for modern colliery, accustomed to A.C. and D.C. work. State wages and experience.—Apply, Powell Duffryn Co., Bargoed. 5681

WANTED, Wiremen, used to all general work, including motors, 'phones; only competent men need apply.—E. C. Goodfellow, 28, High Street, Highgate, N. 6. 8869

WINDERS wanted in London works used to A.C. work. Good wages and permanent position to first-class men.—5630, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

WIREMAN wanted, power, lighting, telephones and bells. Country house and factory. Permanency.—8856, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMEN (two wanted), 30 miles outside London, for high-class house wiring; men used to slip conduit.—Please apply, giving full particulars, whether married, and rate required, to 5680, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMEN wanted: only skilled men accustomed to country house work need apply. Permanency if satisfactory. Rates 16·27d. per hour, plus 12½ per cent., country money extra.—Apply to "E" Department, Mann, Egerton & Co., Ltd., Norwich. 5621

WORKS Foreman wanted for London switchgear works; must have up-to-date methods for competitive production. Permanent and progressive post for right man.—Full particulars of experience, age and wages required, 8823, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

APPOINTMENT FILLED.

PROVINCIAL Cinematograph Theatres, Ltd., desires to thank the 100 applicants for the appointment of Inspecting Engineer, and to inform them that suitable candidates will be communicated with. 5714

SITUATIONS WANTED.

APPOINTMENT WANTED.

MR. CHARLES G. WATSON, late District Engineer Callender's Cable and Construction Co., Ltd., Newcastle-on-Tyne (now demobilised), is prepared to take up an appointment as Constructional Manager or Engineer. Extensive experience of large power transmission work on N.E. Coast.—Address 2, Wimborne Road, N. 17. 8805

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A.A.A. A.A.A. Demobilised Royal Air Force Officer desires engineering post, commercial or technical. Five years' excellent training with large Manchester firm, mechanical and electrical, testing, &c. Last post: assistant engineer to large gas-works, drawing office, &c. Associate of Manchester College of Technology in Engineering (University degree standard). Age 24. Manchester or Birmingham districts.—8808, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A. Accumulator Engineer open to consider position of responsibility. Had a varied experience in all branches for many years. Accustomed to using own initative, &c.—8736, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.M.I.E.E., 16 years' experience in production, design, testing and inspection of small motors, instruments, switchgear, projectors, fan motors, outdoor erection and repairs. Position wanted as chief of department or assistant works manager. Age 33. Salary £350—£400. London or district preferred.—8766, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.M.I.E.E. (29), 13 years' experience, covering operation and testing of all kinds of electrical plant, including five years' sole charge of 5000-KW. generating, power and lighting installation of large mill abroad, desires responsible position.—8847, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A CHARGE Engineer at liberty, power house and marine experience.—8825, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A QUALIFIED Mechanical and Electrical Engineer, 34, with shops, drawing office and commercial experience (some years branch manager) is open for engagement by high-class firm in London. Highest references.—Address "Engineer," 49, Studley Road, S.W. 8850

A YOUNG Man (21) desires switchboard attendantship in progressive station. Experience includes 3½ years in power stations. Student in electrical engineering; Student I.E.E. State prospects; good references.—8816, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ACCUMULATOR Engineer desires appointment as Commercial, Branch or Works Manager; 20 years' experience; M.I.E.E. —5578, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS WANTED.—*Continued.*

ADVERTISER, A.M.I.E.E. (33), married, practical, technical and commercial, desires appointment with progressive manufacturers, as Manager or Departmental Manager. Can introduce several first-class lines, and show good record.—8851, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, conversant with economical running and upkeep of electric light plant, boilers; steam gas and oil engines; lifts and heating apparatus (10 years' hotel experience), seeks position as Engineer-in-charge.—8863, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER desires to place a Lad of 16 (Secondary school education) Apprentice to Electrical Engineering.—Engineer, Power Station, Bedale. 8717

ADVERTISER, many years' experience in all branches of contracting work and having had management of several large electrical contracts under the Ministry, desires change. Position of trust desired in a firm willing to recognise ability and pay for it. Would undertake the working up of a branch business where prospects were good. Willing to go abroad.—8857, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER requires situation (age 30); 13 years in City wholesale house of electrical goods suppliers as salesman, buyer, enquiries, quotations, &c.; good technical knowledge.—8811, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (28), well educated, seeks position, any capacity, London district. Experience in large meter and instrument test-room and with consulting engineer. Would not object to clerical work or temporary. Moderate salary.—8803, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (32), did his bit twice; public school. Sound technical, practical, commercial, contracting experience. Desires position.—8820, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN electric heating and cooking expert offers services to interested concern as Production Engineer, Designer or Sales Engineer. Advertiser has had exceptional experience in all branches. Confidence respected.—8852, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

APPRENTICE. Advertiser, whose son, 16½, is leaving his secondary school, would be glad to hear from a high-class firm of electrical engineers, willing to take a lad as indentured apprentice, without premium.—Address A. J. Godden, Randall House, Wincheap, Canterbury. 8666

BATTERY Fitter desires change, maintenance, &c., preferred.—8848, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMMERCIAL Engineer.—Officer just demobilised (12), married, Long and varied practical experience of all gear and installation. Good health and excellent references; energetic, resourceful. Requires any position with good prospects.—8662, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMMERCIAL Traveller (age 31), demobilised after 4½ years' service, seeks situation with wholesale supply house. Good connection all England.—Ernest G. Roberts, 59, Casewick Road, West Norwood, S.E. 27. 8738

DEMOBILISED N.C.O., R.E. (26), single, six years in M. and E. engineering, five years in army maintaining telephones, switchboard and telegraph apparatus (including W.X. auto), at Army H.Q.; I.C.S. student. Position home or abroad.—S. Cooper, Regent Street, Finedon, Wellingboro'. 8656

DEMOBILISED Soldier (23), requires situation in power station, four years' D.C. experience, mains, Diesel and steam, I.C.S. student, good testimonials.—8858, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN (24), thorough knowledge D.C. design, 70s.—8861, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRIC Light and Meter Inspector (I.C.S. student) seeks a situation with a chance to advance.—8793, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer desires a position of responsibility with electrical contractors at home or abroad. Excellent references; 10 years' theoretical, practical and commercial experience; single, age 27.—8633, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, R.E. (28), desires responsible position, home or abroad; 18 years' pre-War experience, works, central station, factory, &c. Good testimonials and character references.—5661, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer with 20 years' varied experience in works installations, last eight years in charge of large works, good sound practical ideas, drawing office and works training, requires change; salary £300, references.—8731, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer, home and Colonial experience, erection testing and maintenance of hydro and steam plant, now employed inspecting all kinds of plant. Responsible post desired in Manchester district.—8647, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL ENGINEER (29), nine years' experience technical college, works and sales, 4½ years' army (Captain), desires position as Representative or Estimator with supply company or manufacturers, in or near London. Initiative, reliable, first-class references.—8832, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (43) desires Appointment. Good technical training. Many years' experience in charge of lay-out, erection and maintenance of large factory plants and distribution systems. Accustomed to handling men. Good references and testimonials.—8680, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Fitter, 21 years' experience, seeks responsible position, erection machinery, I.C. engines, would undertake maintenance of private plant.—Brown, 37, Bernard St., W.C. 1. 8629

ELECTRICAL Wireman, or Charge Hand, good practical experience, would undertake job, labour only; good references.—"Electrician," 25, Amphill Square, St. Pancras. 8870

ELECTRICIAN wants maintenance job, 6½ years' navy and civilian experience. Good references.—8830, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Fitter (27), demobilised Cpl. R.E., seven years' pre-war experience in erecting and testing all classes D.C. machinery. Board of Education certificates in electrical engineering. Army trade skilled permanent linesman. Any district.—8859, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, Electrical, 26, accustomed operation, upkeep and repair, steam driven A.C. and D.C., high and low tension mining and works plant and equipment, desires appointment.—8759, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER (silver badge) requires permanent post; experienced in D.C. distribution and supply; conversant with all types of steam and internal combustion engines; would take charge or assist if chance of advancement.—8661, ELECTRICAL REVIEW, 4, Ludgate Hill, London

ENGINEER-Electrician, charge, desires post, experienced with all classes of plants, &c., electrical and mechanical.—8860, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER-Electrician desires charge of private lighting installation, experience with steam, suction, gas, oil engines, batteries, bells, telephones, motors, &c. Have had charge of private, hotel, hospital plants. Excellent references.—W. G. H., The Villa, Rowledge, Farnham, Surrey. 8755

EX-Naval Wireless Man seeks appointment with prospects. Nine years' experience, theory, practice and design. Could be of value to electrical instrument manufacturer.—8756, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPORT Trade or Electrical Contracting.—Technical and commercial engineer of 20 years' experience, with personal knowledge of Australasian and Indian markets, seeks responsible Managerial post.—8807, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FIRM of Electrical and Mechanical Engineers can recommend capable Engineer, take charge estate or country house plant; experienced steam, gas, oil engines, pumps, lighting, batteries, telephones, heating.—Write first instance Ekless Bros., 5, Huntingdon Road, East Finchley, N. 2. 8862

MECHANICAL electrical certificated engineer desires a position as Works Engineer or Superintendent, having long experience in power stations, works, test houses, office, &c.—8741, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PRODUCTION or Process Engineer, demobilised infantryman (29), single, wants position as Assistan but with prospects, 12 years' practical and technical experience, bench and machine, lathes, presses, millers, autos and manufacturing plant routine, drawing office, stores and estimates.—8855, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

RE-ENGAGEMENT as O.H. Linesman or Foreman Linesman, 20 years' experience on contracting and maintenance; excellent references.—Watt, 121, Riverdale Road, Erith. 8819

TELEPHONE Engineer with wide experience of automatic and C.B. working both at home and abroad, seeks position of responsibility.—8727, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS WANTED.—*Continued.*

TO Merchants and Manufacturers desirous of a good Commercial Engineer, Branch Manager, or Works Manager, the advertiser offers his services; has been Branch Manager for a firm of Manufacturers for the past 12 years; is not particular as to the exact nature of the business as can readily adapt himself to requirements; is a Member of the Institution of Electrical Engineers; 43 years of age.—5580, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TWO Wireman's Mates, experienced; demobilised.—A. S., 7, St. Luke's Road, Clapham. 8749

WIREMAN, good all-round, and Mate; disengaged.—15, Gillett Street, Kingsland, E. 8. 8834

WIREMAN or Charge Hand, power, lighting, 'phones. Good refs.—W., 98, Wycliffe Road, Battersea. 8795

WIREMAN, used factory lighting, bells, screwed barrel, seeks permanency where could gain experience power work.—8839, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN wants work.—W. 13, Palace Square, Upper Norwood, S.E. 8854

WIREMAN, wide experience, competent, reliable; installations or maintenance, lighting, bells, 'phones, plant work, all systems.—8665, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PARTNERSHIPS.

A.M.I.E.E. Ex-Captain open for electrical or motoring appointment or both. Can place to £1000 to start works.—8836, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, an Electrical Engineer (27) prepared to invest capital up to £1000 would like to hear from small energetic engineering firm preferably engaged on the electrical side of automobile and aircraft work. Is well qualified to collaborate with a practical business man desirous of extending his business. Advertiser has specialised in design and construction of car lighting and starting equipment and could introduce own ideas. Sound electrical and mechanical training and first-class reference.—Write Box 699, Willings, 125, Strand, London, W.C. 2. 5704

ELECTRICAL Contractor (Midlands) requires practical working Partner to extend business to neighbouring town; small capital.—8844, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PARTNER (energetic) wanted immediately by contractor in North West of England (power expert preferred), capital required £500 to £1000. Present turnover £4000 per annum. Every indication of turnover being doubled.—State full particulars of experience, age, references, &c., to 8871, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SPLENDID opportunity for working partner in contracting business in Yorkshire. £200/300 capital needed.—8802, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AGENCIES.

ELECTRICITY.

THE important Spanish concern, "Vallet y Bofill, S. en C.," of Barcelona, with exclusive Spanish personnel, desires to get into touch with British Manufacturers of Electric Material, such as Lamps, Motors, Transformers, Telephone Instruments, and any other products connected with this line.

Apply to VALLET Y BOFILL, S. EN C., Barcelona, Paseo de Gracia 20, Spain. 5663

REPRESENTATION.

VERY well-introduced firm seeks the sole representation of Wire and Cable factories, as well as of all kinds of articles in the electro-technical branch, exclusively for Holland and perhaps for Belgium. First-class bank references.

Apply to No. 3805, Advertising Agency, Max R. Nunes, Amsterdam. 5702

SOUTH AMERICA.

REPRESENTATIVES wanted in South America by large British firm of electrical engineers and cable makers. Must possess highest qualifications, technical, financial, commercial and social.—Apply with fullest particulars to 5740, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

AGENCIES.—*Continued.*

AGENCIES wanted by demobilised Engineer; prior to War representing electrical manufacturers in Manchester and Newcastle.—8718, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

BELGIUM.—Experienced Electrical Engineer with high references wishes to represent British firms for every kind of electric lighting and heating appliances, also electrical specialities, &c.—Apply to G. Boyazis, 472, Chaussee de Waterloo, Bruxelles, Belgium. 8804

BRITISH Engineer, with considerable capital and 10 years' experience of importation business in Brazil, will arrive in England about end of June, to arrange for Agencies.—Firms desirous of Representation kindly write, first instance, to Box 215 "C," Smiths, 21, Bush Lane, London, E.C. 4. 8840

ELECTRICAL Engineer, M.I.E.E., with many years' commercial experience, and in touch with most of the central station engineers in the North of England, is open to consider agency which will produce a return of £750 to £1000 per annum.—5579, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, travelling Lancashire, &c., is open to represent a firm that can undertake the manufacture of large quantities of Cinematograph Carbons.—8713, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FIRM of electrical engineers and factors, with offices in developing Yorkshire district, wish to communicate with manufacturers requiring representation.—8801, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR South of France (Lyon to Bordeaux, downwards) a qualified Civil Engineer, extensive connections, highest credentials, wishes to represent large English electrical manufacturing companies in the following: Central station equipment and power supply, E.H.T., H.T., L.T., A.C., D.C.; factory and house services; power and lighting accessories; electrical motors A.C., D.C., and components; railway, tramway signalling apparatus; rail insulators; rail bonds; overhead lines, &c.—8794, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENTLEMAN returning to Canada in about three months, desires Agencies in Electric Supplies, Glassware and Motor Accessories. High-class connection from coast to coast. Highest references.—5662, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LONDON Representation.—London firm of engineers and merchants, with travellers working London and Home Counties, desires Agencies for Electrical Accessories on commission basis. Central premises, telephone, &c.—Apply by letter, in first instance, to L. G., c/o Willmore's, Chiswell Street, London, E.C. 8841

MIDLAND Engineering House desire one or two Agencies for Electrical or Mechanical lines, also for Small Motors for model work.—8810, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.

COUNTY BOROUGH OF SWANSEA.

Electricity Department.

FOR SALE, ONE LANCASHIRE BOILER, 8 ft. by 30 ft., working pressure 160 lbs., 6000 lbs. water evaporated per hour, complete with fittings, by Yates & Thom, Blackburn, built 1900.

Passed satisfactorily by Vulcan Insurance Co. 11/4/1919 until 11/6/1920.

Boiler may be inspected or any further particulars obtained at Corporation Electricity Works, Strand, Swansea.

Offers endorsed "Lancashire Boiler," to be delivered at my office not later than 12 NOON, JULY 3rd.

The Corporation do not bind themselves to accept any price.

H. LANG COATH,
Town Clerk.

Town Hall, Swansea,
19th June, 1919. 5685

MACHINERY.

6-H.P. MOTOR, by Parkinson; 6-H.P. and 1½-H.P. Motor, by Fuller Electrical Co.; 3 1-H.P. Motors, by Parkinson. All for 400 volts, 50 periods, 3-phase, slide rails and starter.

5-H.P. A.C. Motor, slip ring, 3-phase, 50 periods, 440 volts, with starting switch. One 2-B.H.P. Electric Motor, by Westminster Engineering Co., 200 volts, 1,200 revs.

Two 3-H.P. D.C. Motors, by McDonald, Syer & Co., 400 volts.

One 15-B.H.P. Laurence-Scott Motor, 110 amps. 120 volts.

Electric Lighting Generating Set, including Dynamo, 26-KW., 4-pole, 200 volts, 130 amps., and two enclosed High Speed Engines.

CHARLES D. PHILLIPS,
Emlyn and Central Works, Newport, Mon. 5699

(Continued on next page.)

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

A.C. MOTORS, 3-PHASE, 50 CYCLES.

150	H.P.,	415 volts,	290 revs.,		Slip-ring.
100	,,	500 ,,	720 ,,		,,
200	,,	440 ,,	480 ,,		Squirrel cage.
70	,,	500 ,,	580 ,,		Slip-ring.
60	,,	440 ,,	580 ,,		Squirrel cage.
60	,,	500 ,,	720 ,,		Slip-ring.
50	,,	400 ,,	720 ,,		,,
40	,,	440 ,,	720 ,,		Squirrel cage.
35	,,	440 ,,	720 ,,		,,
32	,,	440 ,,	575 ,,		,,
25	,,	400 ,,	960 ,,		,,
20	,,	440 ,,	480 ,,		,,
20	,,	440 ,,	950 ,,		,,
20	,,	400 ,,	716 ,,		,,
12	,,	400 ,,	720 ,,		,,
10	,,	420 ,,	960 ,,		,,
7	,,	400 ,,	711 ,,		,,
6	,,	420 ,,	960 ,,		,,
6	,,	500 ,,	940 ,,		Slip-ring.
5	,,	420 ,,	1420 ,,		Squirrel cage.
3	,,	400 ,,	1000 ,,		,, T.E.

D.C. MOTORS, 400/500 VOLTS.

168	H.P.,	460 volts,	500 revs.,	Shunt,	interpole.	
100	,,	400 ,,	720 ,,	,,	,,	
80	,,	440 ,,	600 ,,	,,	,,	open type.
70	,,	440 ,,	650 ,,	,,	,,	enclosed vent.
60	,,	400 ,,	700 ,,	,,	,,	open type.
40	,,	400 ,,	600 ,,	,,	,,	enclosed vent.
35	,,	500 ,,	600 ,,	,,	,,	variable speed.
32	,,	460 ,,	950 ,,	,,	,,	interpole.
25	,,	500 ,,	400 ,,	,,	,,	pipe vent.
23	,,	400 ,,	650 ,,	,,	,,	interpole.
20	,,	440 ,,	825 ,,	,,	,,	variable speed.
10	,,	440 ,,	1000 ,,	,,	,,	enclosed vent.
9	,,	440 ,,	700 ,,	,,	,,	semi-enclosed.
7½	,,	440 ,,	1000 ,,	,,	,,	enclosed vent.
5	,,	440 ,,	1200 ,,	,,	,,	,,
4½	,,	460 ,,	1000 ,,	,,	,,	totally enclosed.

D.C. MOTORS, 200/250 VOLTS.

70, 60, 20, 15, 10, 7½, 6, 3½, 3, 2½, 2, 1 H.P.

D.C. MOTORS, 100/125 VOLTS.

17, 12½, 10, 7, 3½, 3, 2, 1 H.P. also, 350 amp., 60 volts.

GENERATING AND GAS ENGINE SETS.

87-KW., 230-volt, direct-coupled Generating Set.
Two 50-H.P. Gas Engine Sets, 30-KW., 230-volt.

C. L. TURNER,
49, Deansgate, Manchester. 5729

PLANT FOR SALE.

THE UNITED GLASS BOTTLE MANUFACTURERS, LTD., 195, Strand, London, W.C. 2, have for disposal the following plant:—

One direct-coupled, steam-driven, continuous-current Generator, 30-KW. capacity at 105 volts pressure; Multipolar Silvertown Dynamo; Engine, by Shanks, non-condensing and running at 300 revolutions per minute when supplied at 60-lbs. steam pressure.
One No. 8 Baker Blower, belt-driven.
One Vertical Boiler, 5′ diameter, 8′ high, for 60-lbs. steam pressure.
One Engineer's Drilling Machine.
One 5-cwt. Steam Hammer, suitable for 60-lbs. steam pressure.
One 2-ton Friction Winch, complete with 500-volt continuous-current Motor and Controller.
Three small Horizontal Steam Engines for 60-lbs. pressure, used for driving scrapers of Green's Economisers.
Two Horizontal Air Compressors for electric motor drive.

Owing to a change from continuous current to alternating current, there are a large number of continuous-current 500-volt Motors for disposal. Full list of the machines will be supplied on application.

Offers should be made to THE UNITED GLASS BOTTLE MANUFACTURERS, LTD., c/o Cannington, Shaw & Co., Ltd., Sherdley Glass Works, St. Helens. 5658

MOTORS.

FOR SALE. 23-H.P., 500 volts, 39 amps., D.C. Motor by Laurence, Scott, 540 revs., compound wound and fitted with interpoles, automatic starting and reversing switchgear, magnetic brake, extended shaft and outer bearing. Excellent condition. Also nearly new 22-H.P., D.C. Aston Motor, 500 volts, 450 R.P.M., compound wound with interpoles, protected type, on sliding base with belt pulley 17 ins. dia. and 16 ins. face, complete with main switch and starter.

JOSEPH PUGSLEY & SONS, LTD.,
Cattybrook Iron Works, Lawrence Hill, Bristol. 5716

FOR SALE.—*Continued.*

FOR SALE.

COMPOUND-wound Bi-polar Dynamo, 220 volts, 450 amps., 550 revs., by Scott & Mountain.
Vertical Compound Engine 8″ and 15″ cyls., 10″ stroke, by the Brush Co.
Compound Horizontal Tandem Engine, 10″ and 18″ cyls., 32″ stroke, by Hornsby & Co.
Vertical Compound Steam Vacuum Pump, 6″ and 12″ steam cyls., 17″ air cyls., 8″ stroke, capacity about 1000 cu. ft.
Horizontal Air Compressor, 14″ cyls., 14″ stroke, by the Chicago Pneumatic Tool Co.
Nine 9″ Parting-off Machines, by J. Butler & Co.
No. 3 Four-spindle "Acme" Automatic Screw Machine, for ⅝″ bars.
30″ swing Vertical Boring Mill, table 2′ 4″ dia., by Brown and Sharp.
Six 21″ swing Gisholt Combination Capstan Lathes.
Six 13″ swing Gisholt Combination Capstan Lathes.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS. Free on Application. Inspection invited.

THOS. W. WARD, LTD., Tel.: "Forward, Sheffield." ALBION WORKS, SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,

and at Milburn House, Newcastle-on-Tyne.

Tel.: 44 Wakefield. 867 Newcastle. Telegrams: "Engineer, Wakefield."

FOR SALE.

ONE 1500-KW. Turbo-Alternator, 2000/2200 volts, 50 periods, two-phase, speed about 1500 R.P.M., by C. A. Parsons.

One Willans-Parsons Steam Turbo Set, 1200 KW., with Alternator, 1200 R.P.M., 200 lbs. to sq. in., 11,000 volts, three-phase, complete with exciter; also condensing plant, air, and circulating water pumps, &c.

One 500-KW. triple-expansion Set, engine by Browett and Lindley, H.P. cyl. 17¼″, I.P. 25″, L.P. 35″ × 14″ stroke. Single-phase Alternator, by British Westinghouse Co., 2100 volts, complete with exciter, &c.

One 150-KW. Set, Reavell compound engine, 270 B.H.P., cyls. 20″ dia. × 10″ stroke generator, D.C., 460/500 volts.

Three Hopkinson Electrical Coal Cutting Machines, 20 H.P., 440/500 volts. 5277

HIGH-CLASS LANCASHIRE BOILERS.

ONE Butt Rivetted Lancashire Boiler, by Yates & Thom. 30′ long by 8′ 6″ diameter. Not done 10 years' work. Equipped with set of mountings and fittings and insured at 160 lbs. pressure.
Two High-pressure Lancashire Boilers, made by Tetlow Bros., Oldham. 30′ long by 8′ diameter, with set of mountings and fittings. Insured at 200 lbs. pressure.
Four Lancashire Boilers, made by Galloways, Ltd., 28′ long by 7′ 6″ diameter, with butt-rivetted shells, and set of mountings and fittings, for 80/90 lbs. pressure.

THOMAS MITCHELL & SONS, LTD.,
Edgar Street, Bolton.

Telegrams: "Realize." Telephone: 302. 5600

FOR SALE.

FOUR LARGE HIGH-SPEED THREE-PHASE MOTORS.
Two MOTORS—absolutely new and unused.
Two MOTORS—run 1000 hours only.

Motors are of high-speed, heavy two-bearing type of Premier, British make, mounted on box bedplate; suitable for coupling to pumps; complete with direct-coupled exciter and synchronous rotor; alternatively have asynchronous rotors available.

Output	...	...	500 B.H.P.
Speed	...	...	1500 R.P.M. (synchronous).
Voltage	...	...	440 volts.
Frequency	...	...	50 cycles.

Starter can be arranged for either synchronous or asynchronous rotors; as synchronous machines they are self-starting.

Write for prices and particulars to—
8733, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

ELECTRIC MOTORS FOR SALE.

FROM 5 H.P. to 45 H.P., with Starters complete, D.C., manufactured by the British Thomson-Houston Co. and Messrs. Rhodes, Doncaster.

JOHN CLAES, DEVIS & CO., LTD.,
30, Thomas Street, E. 14. 5457

(Continued on next page.)

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

GENERATING SETS, D.C.

One 256-KW. Belliss Siemens 460/500 volts.
One 185-KW. Browett-Lancashire, 460/500 volts.
165-KW. Allen, 220 volts.

TURBO-GENERATORS, D.C. AND A.C.

1000-KW. B.T.H., 440 volts, 50 period, three-phase, with condensing plant complete.
One 500-KW. Parsons Turbo, 460/530 volts, complete with condenser.

GENERATORS OR MOTORS, D.C. AND A.C.

One Crompton 150 H.P., 440 volts, 25 period, three-phase, slip-ring, 1150 R.P.M.
One Phœnix 290 H.P., 460 volt D.C., 400 revs., three bearings.
Two 60-H.P. B.T.H., slip-ring Motor, with rotor starters, practically new, 400 volts, 50-period, three-phase, 960 revs.
One 50 H.P. semi-enclosed type, 500 volt. 50 period, three-phase, slip-ring, by A.E.G. Co., speed 975 revs., with A.E.G. Liquid Starter and Ellison's three-pole Circuit Breaker.
One 25-H.P. Mather & Platt slip-ring Motor, 500 volts 50 periods, 3-phase with starting pillar, slide rail and standard pulley.
One Siemens Generator (massive three bearing machine), 135 volt, 200 amps., 950 revs.
Two 20-H.P. shunt wound, B.T.H., 220/250 volts, 725 revs., and Starter.
Six 2½-H.P., B.T.H., 400 volts, 50 periods, three-phase, squirrel-cage, 720 revs, with Starters complete.
One 3·6-H.P., compound wound with interpoles, B.T.H., 450 revs.
One 10-H.P. Verity's compound wound, with Interpoles, 220 volts, 1050 revs., with Starter.
One 10-H.P. E.C.C., compound wound, with Interpoles, 220 volts, 550 revs., with Starter.
One 30-H.P. Phœnix, compound wound, with Interpoles, 220 volts, 750 revs., with Starter.
One 3-H.P. Siemens shunt-wound, 220 volts, 1400 revs., with Starter.
One 2·5-H.P. ditto, 1470 revs., with Starter.

BOILERS.

Three 30-ft. × 8 ft. 6 in. Lancashire Boilers with all fittings; Danks make, 1915; insured 150 lbs. pressure; can be put on rails immediately.

Apply FRANK GILMAN, 9, Westfield Road, Birmingham.

Telegrams: "Rotherwood, Birmingham." Telephone: 1081 Edgbaston. 2128

ELECTRICAL MACHINERY FOR DISPOSAL.

SWITCHGEAR, &c.—One 350-KW. Marble Panel, consisting of 1,200-ampere, three-phase, oil-immersed switch, three-way meter switch, contactor, and auto-current cut-out, fuse holders, &c.
Hartman & Braun type volt and ammeter for 250-volt, and 1,200-ampere respectively, watt-meter, three-phase reading to million B.O.T. units. Exciter panel rheostat and current rheostat, complete with shunts and instrument transformers. Price £140.
One D.C. marble panel, 5 D.P. switches and fuses, £10 10s.
One D.C. enamelled slate panel, and 2 D.P. main switches.
Weston volt and ammeter for 250 volts, 3,000 amperes, £40.
Nine 60 to 150-ampere triple-pole switch fuse panels with ammeters, totally enclosed, fool-proof. From £7 10s. to £9 10s. each.
One 450-KW. D.C. switchboard, consisting of three panels; two main automatic switches for 3,000 amperes; two D.P. main switches for 3,000 amperes; two D.P. main switches for 3,000 amperes; two D.P. main switches for 400 amperes; voltmeters to 300 volts; ammeters to 3,000, by Weston. Price £150, or will sell separately.
Eleven 3,000-volt, 100-ampere, three-phase oil-immersed trip switches, each fitted with two overload trips, and arranged for switchboard mounting. £10 each.
Twelve 3,000-volt, three-phase oil switches. £4 to £6 each.
A number of ampere and voltmeters of varying amperage from 40 to 600, voltage from 15 to 300. Prices from 12s. to 30s. each.
Static ground detectors; electricity meters. From £3 each.
Large D.P. switches, disconnecting boxes, junction boxes, slate and marble panels.

Please send us your enquiries.

JOHN F. WAKE,
Darlington. 4828

URBAN DISTRICT COUNCIL OF FELIXSTOWE AND WALTON.

TENDERS are invited for the purchase of the following, which can be viewed by appointment at Felixstowe:—

Two, O.E. size, horizontal Stockport Gas Engines, piston 12", dia. 18" stroke; each fitted with two extra heavy fly-wheels, sensitive governor, electric and tube ignition; speed 210 R.P.M.
Two 4-pole, shunt-wound, Generators, 20 KW. each, speed about 900 R.P.M., 200/220 volts, with slide rails.

Tenders should be addressed to the CLERK TO THE URBAN DISTRICT COUNCIL at the Town Hall, Felixstowe. The machines will be dismantled by the staff of the generating station, and delivery will be given on the generating station site.
The Council do not bind themselves to accept the highest or any tender. 5676

FOR SALE.—*Continued.*

D.C. AND A.C. MOTORS.

D.C. MOTORS IN STOCK.

H.P.	VOLTS.	R.P.M.	TYPE.	MAKERS.
45	440	860	Shunt intplr.	Brit. Westinghouse Co., Ltd.
20	440	700	Comp. intplr.	Do. do. do.
20	460	1250	Shunt intplr.	The Electric Con. Co.
20	460	1150	Shunt wound.	The General Electric Co.
13	420	1000	Shunt intplr.	Mather & Platt Ltd.
12	200/210	950	Shunt wound.	The Lancs. Dynamo, Ltd.
10	200	800	Comp. wound.	Cutting Bros.
5	460	1200	Shunt wound.	Wright & Wood, Ltd.
5	230	1550	Do. do.	The General Electric Co.
4½	220	1000	Do. do.	Siemens Bros.
3	230	1375/1400	Do. do.	Wright & Wood, Ltd.
3	200	1250	Do. do.	The Deihl Elec. Co.

A.C. MOTORS IN STOCK.

H.P.	VOLTS.	PERIODS.	R.P.M.	PHASE.	TYPE.	MAKERS.
50	400/140	50	750	Three.	Slip-ring.	Siemens Bros.
12	420	50	960	Do.	Do.	G.E.C.
10	420	50	1000	Do.	Do.	Pru h Elec Co.
10	400	50	1440	Do.	Squirrel cage.	Howells & Co.
7½	400	50	1440	Do.	Do.	Do. do.
5	100	80		Single.	Squirrel cage.	Richard and [Rhodes.
5	420	50	1430	Three.		Wright & Wood.
3	420	50	1450	Do.	Squirrel cage.	Do. do.
1½	200	50	1000	Do.		Howells & Co.

One 45-B.H.P. National Gas Engine, two flywheels, tube ignition, balanced crank, self-starter, complete with oil splash guard, air box, silencer, gas bag, three cooling tanks, hand rails and pipes.
One Newton Dynamo, 125 amps., 220 volts, compound wound, carbon brushes, complete with amp.-meter, voltmeter, belt pulley and slide rails.
One 12-B.H.P. National Gas Engine, two flywheels, tube ignition, complete with air box, gas bag, silencer, two cooling tanks, hand-rails and pipes.
One Newton Dynamo, 35 amps., 220 volts, compound wound, carbon brushes, complete with amp.-meter, belt pulley and slide rails.
The above can be purchased separate or complete.

YARNALL & CO.,
Cornwall Street Ironworks,
Openshaw,
Manchester.

Telegrams: "Yarnall, Openshaw."
Telephone: Openshaw 23. 5713

MACHINERY FOR SALE.

GAS Engine, 160 H.P., by Crossley; self-starter, two mags., suction plant.
Gas Engine, 100 H.P., by Hornsby-Stockport; self-starter, suction plant.
Gas Engines, 60 H.P., Stockport.
Oil Engine, 40 H.P., by Crossley, with 28-KW. Dynamo, 220 volts; all accessories.
Generator, 6 pole, G.E.C., 110 volts, 1200 amps.
Generator, 6 pole, 110 volts, 620 amps.
Electric Motor, 126 H.P., 480 v., switch panel.
Electric Motor, 75 H.P., 480 volts, with starter.
Electric Motor, 33 H.P., 440/460 volts, with starter.
Electric Motor, 30 H.P., 440/480 volts, with starter.
Electric Motor, 25 H.P., 480 volts.
Electric Motor, 26 H.P., 220 volts.
Electric Motor, 10 H.P., 500 volts.
Two Electric Motors, 3 H.P., 500/530 volts.
Three Electric Motors, 2 H.P., 400/480 volts.
All for Immediate Delivery.

A. UNDERWOOD, 3, Queen Street, E.C. 4. 8864

NEW D.C. MOTORS IN STOCK.

H.P.	Volts.	Revs.	Number in Stock.
2	110	1160	1
2·5	110/550	1100	4
4	110	1070	18
5	110	1000	2
6·5	220	1160	2
7·5	110/550	880	10
10	110/220	870	14
25	220/550	810	9
25	220/480	660	10
30	220/480	750	14

THE VICTORIA ELECTRIC PLANT CO.,
Spenser Street, Victoria Street,
Westminster, S.W.

Telephone: Victoria 4026.
Telegrams: "Vicminster, Sowest, London." 4958

(*Continued on next page.*)

FOR SALE.—*Continued.*

MOTORS AND GEARS, etc.

FOR IMMEDIATE DELIVERY. New.
D.C. 400 to 460 volt.
2, 15, 16, 18, 30, 35-H.P.
Ditto, 110-v.
1/4, 1.5, 2, 3.5, 15-H.P.
110-v. Generators, 30 × 165 amps.
200 to 250-volt Motors.
.6, .8, 1.5, 20-H.P.
A.C. single-phase.
200-volt, 50 periods.
.5, 3.5, 2 5, 4, 5-H.P.
A.C. 2-phase. 200-v., 50 periods.
2, 5. 6, 10, 15, 18, 25, 30-H.P. Short Circuits and Slip Rings.
A.C. 3-phase. 220 and 440-v., 50 periods.
5, 10, 15, 27, 30, 35-H.P. Short Circuits and Slip Rings.

FULLY GUARANTEED.

Three sets of three-throw Pumps, 6 × 8, Gun Metal Fittings. Belt or Motor Driven.
10 miles, 1/18, 600 megs. Cable.
6 „ 3/23 ditto.
3 „ 3/20 ditto.
2 „ 7/20 ditto.
1 „ 7/18 ditto.
1 „ 7/14 ditto.
1/2 „ 19/14 ditto.
1/2 „ 37/14 ditto.
15 gross 70/40 Workshop Flex.
10 „ 35/40 ditto.
12 „ 70/40 Twisted Flex.
14 „ 35/40 ditto.
D.P. Disboard teak and ironclad Case.
D.P. and T.P. ironclad Switch and Fuse.

All the above are concrete and sound, British manufacture, fully guaranteed.
Your favours please.

ROBUST MACHINERY,
63, Bradford St., Walsall. 5710

G. R.

BY DIRECTION OF THE DISPOSAL BOARD, MINISTRY OF MUNITIONS.

SALE BY PUBLIC TENDER.

THE "EDITH CAVELL" PROJECTILE FACTORY.

(Messrs. Mechans, Ltd., Overnewton, Glasgow).

TENDERS are invited for the purchase of Machine Tools, Plant, Office and Canteen Furniture at the "Edith Cavell" Projectile Factory, Glasgow, comprising :—
Heavy duty lathes, 9½-in centres. by J. F. Low.
Sensitive Drilling Machines, by Jones & Shipman.
Double-sided Single-stroke Power Presses, by Bradley & Craven.
Scales and Weighing Machines, by Tooley.
Air Compressor Plant, by Lacey Hubert.
Vertical Patent Multitubular Boiler, 7 ft. dia. × 15 ft., by Cochran.
A.C. Motor, 30 H.P. 3-phase, 440 volts 25 periods, 750 R.P.M., by Brush & Co.
A.C. Motors, 50 H.P. 3-phase, 440 volts 25 periods, 750 R.P.M., by E. Brook, Ltd.
Quasi Arc Electric Welding Units for 110 volts, single-phase, 25 periods.
Narrow pattern Forge Blowers, by Keith & Blackman.
Gas Welding Plant, including Acetylene Generator, Purifiers, &c.
Shafting, Pulleys, Belting, &c.
Time Recorder, Model 950, by International Time Recorder, Ltd.
Office and Canteen Furniture and Equipment.
Purchasers to dismantle and remove in all cases.
Tenders for the above will be received up to 10 a.m. on JULY 9th, 1919.
Tender Forms and permits to view can be obtained from the CONTROLLER, Plant and Machinery Section, Charing Cross, Embankment Buildings, W.C. 5698

GENERATING SET.

FOR Immediate Sale and Delivery : 300-H.P. Generating Set, by Reavell ; Three-crank Compound High-speed Enclosed Engine, coupled direct to Generator by Brown, Boveri & Co., 190 volts, 375 revs. In first-class condition ; can be seen running.

JOSEPH PUGSLEY & SONS, LTD.,
Cattybrook Iron Works, Lawrence Hill, Bristol. 5717

FOR SALE.

BRUCE PEEBLES Balancer, consisting of two 115-KW., 250-volt, 450 R.P.M. machines, coupled together on two-part bedplate. Each machine has two bearings, and they could be used separately as motors or generators.

THE PHŒNIX ELECTRICAL CO., 32/36, Broomielaw, Glasgow. 5563

FOR SALE.—*Continued.*

G. R.

BY DIRECTION OF THE DISPOSAL BOARD, MINISTRY OF MUNITIONS.

TRADESMEN'S TOOLS, &c., FOR SALE BY TENDER.

The undermentioned material is for disposal :—

AT WOOLWICH ARSENAL.

Tradesmen's Tools as follows :— Ref. D.D. 8/Group/76.

Anvils, 5 lb. 10 oz. ; Awls, various ; Bellows, various ; Braces, carpenter's ; Bits, nose ; Chasers, fine thread, various ; Chisels, Greasers, Crowbars, Cutters, Fullers Gimlets, Gouges, Grindstones ; Hammers, riveting, &c. ; Tinman's Block, Holders ; Horses, tinmen's ; Irons, various ; Knives, various ; Lead, punching, pieces ; Mallets ; Needles, various ; Palms, saddler's ; Pincers, various ; Pipe Cutters, various sizes ; Planes, various ; Plates, angle, &c. ; Pliers ; Pots, glue ; Pritchels, farrier's ; Punches, oval various sizes ; Rasps, various ; Rippers, slater's ; Rules, gazier's, &c. ; Saws various ; Slices, farrier's ; Snaps, tinman's, &c. ; Spanners, various ; Stakes, smith's ; Stamps, farrier's ; Sticks, bossing, &c. ; Stones, farrier's ; Tongs, farrier's, &c. ; Tools, blacksmith's ; Vices.

Matchets, 30,000 ; with Sheathes, 30,000 ; Lanyards, 20,000. D.D./8/Group/94. „ „ D.D. 8/Group/118.

Bolts with Nuts, large quantities, various sizes :—
Csk., hd. sqr. ; csk., hd. sqr., bevelled ; csk., hd. V. ; hex. hd. ; csk., hd. sqr. ; bosshead, sqr ; sqr. hd. ; bosshead, bright slotted ; cheesehead, sqr. ; cheeseheads, 1", 1¼". ¼" dia., bosshead V. Nuts, hex., castellated. Nails, steel clasp, 2" ; nails, steel clout, flathead, 1¼" and 1¾" ; nails, steel clout, bosshead, ¾" and 1¼" ; nails, iron mop. Tacks, steel clout, ¾", 1⅛", and 1½". Staples, special.
Hammers, stone-breaking, 2 lb., 4 lb., and 6 lb. D.D. 8/Group/172.
Pickaxe, handles 36", 84,900. D.D. 8/Group/222.

AT DIDCOT.

Wire Nails, large quantities. D.D. 8/Group/117.
„ „ rd. 1¼" and 3". „
„ „ iron spike, 5", 6" 7", 8" and 9". „
„ „ steel cut, rosehead, 7". „
Staples, fencing (No. 8 S.W.G.), 1½", splice cut. „
„ „ „ 1¾" pointed. „
Hammers, stonebreaking, 4 lb., 10,000. D.D. 8/Group/163.
Pickheads, 8 lb., 16,000. D.D. 8/Group/244.
Shovels, sqr. mouthed, 12" × 10", 15,000. „
Wheelbarrows, intrenching, without wheels, 9,750. „
Wheels, flat tyre, 17,750 „

AT BURTON-ON-TRENT.

Brass wire nails, 2" × 10-G., 33,000 lbs. D.D. 8/Group/185.
„ „ „ 1" × 14-G., 4,500 lbs. „
„ wood screws, 1¾" × 12-G., 21,000 gross. „

AT CHILWELL, NOTTINGHAM.

Pick helves, ash, 36", 100,000 D.D. 8/Group/223.

Samples may be seen at D.B. 5.a. Engineers' Store (Gallery), Agricultural Hall.

Further particulars and Tender Forms may be had on application to the CONTROLLER, Factory, Consumable Stores Section, Government Disposal Board, 37/41, Old Queen Street, Westminster, S.W. 1. Please quote references. 5703

G. R.

BY DIRECTION OF THE DISPOSAL BOARD, MINISTRY OF MUNITIONS.

ELECTRICAL PLANT FOR "COTTRELL" PRECIPITATOR, AT OLDBURY EXPLOSIVES FACTORY. FOR SALE BY TENDER.

TENDERS are invited for the purchase of :—
Four Rectifiers, driven by 2-H.P. 400-volt, 3-phase, 25-cycle, Synchronous Motors.
Four Switch Panels, Transformers and Resistances for above.
Four 10-K.V.A., E.H.T. Oil Immersed Transformers ; primary 400 volts, secondary 82,000 volts.
Nine 45-gallon drums Transformer Oil.
A number of E.H.T. Insulators, with Spindles and Caps.
All above plant is new and unused.
Tenders to be lodged not later than 10 a.m. on 3rd JULY, 1919.
Applications for tender forms and permits to view to be made to the CONTROLLER, D.B.1.e., Charing Cross Embankment Buildings, W.C. 2. 5602

(*Continued on next page.*)

FOR SALE.—*Continued.*

G. R.

BY DIRECTION OF THE DISPOSAL BOARD,
MINISTRY OF MUNITIONS.

TRADESMEN'S TOOLS, &c., FOR SALE BY TENDER.

The undermentioned material is for disposal :—

AT LITTLEHAMPTON.

Bolts with Nuts (Large Quantities)	Ref. D.D. 8/Group/112.	
Bosshead, square, various sizes		"
" " " Hexagon Head	" "	"

AT SHORNCLIFFE.

Pickaxe Handles, 36-in., 87,000	Ref. D.D. 8/Group/217.	

AT BIRMINGHAM. D.D. 8./Group/221.

Pickaxe Heads, 100,000.
R.E. Shovels, 12" × 10", Square Mouthed, T. Handles, 300,000.

AT NEWHAVEN. D.D. 8./Group/245.

Barrows, Wheel (Intrenching) without wheels		
(New)	168	"
" " (Secondhand)	62	"
Wheels, Flat Tyre (New)	168	"
" " (Secondhand)	62	"

AT SHORT'S GARDENS, LONDON.

Rivets (large quantities).	D.D. 8./Group/327.	
Iron s/hd., pan/hd., c/hd., flat/hd. and cap csk., spike, various sizes.		"
" Tinman's Black, Nos. 1, 2, 3, 4, 5, 7, 9 and 11.		"
" Brass s/hd. and csk., various sizes.		"
" Copper flat/hd., s/hd., csk., &c., various sizes.		"
" Alum. flat/hd. and csk., various sizes.		"
" Steel csk.		"
" Assorted.		"
Washers, copper, 5/16 and 3/32.		"
Punches, Centre 4½", 6000.		"
" Pin 5" × ⅜" × ⅛", 1500.		"
" Pin 8" × ⅜" × ¼", 1000.		"
Ball Journal Bearings—	D.D. 8./Group/181.	
20 bore × 47 o/D × 14 m/m width.		"
35 " × 72 " × 17 "		"
55 " × 100 " × 21 "		"
35 " × 80 " × 21 "		"

AT R.E. STORES DEPOT, PLAISTOW AND WEST HAM.

Ref. D.D. 8/Group/476.

Water Piping, Wrought-Iron or Mild Steel B.S. threads, socketted, oiled outside, tested 300 lbs. per sq. inch.			
"	6"/6¼" O.D. × 7 imp. W.G.	142 539 ft.	"
"	4"/4½" " × 7 "	353,390 ft.	"
"	1½"/1 29/32" " × 9 "	484,228 ft.	"
"	1¼"/1 11/16" " × 9 "	4.752 ft.	"
"	1"/1 11/32" " × 10 "	266,058 ft.	"

Fittings for ditto—

Bibcocks,	1" Brass screw-down, screwed for iron tested 300 lbs. per sq. in.	2,148	"
"	¾" ditto	20,984	"
Valves.	Air, 4" automatic c.i. body, 4" Vulcanite Ball and undrilled flange, tests 300 lbs. per sq. in.	180	"
"	Air, 3" ditto	123	"
"	Reflux, 4" with c.i. body and g.m. faces and undrilled flanged ends.	411	"
"	Reflux, 3" ditto	95	"
"	Stop or sluice, 6" flanged c.i. body with undrilled flanges, fitted with 4 g.m. faces and g.m. spindle, tested 300 lbs. per sq. in.	167	"
"	Stop or sluice, 4" ditto	818	"
"	Stop or sluice, 3" ditto	666	"

AT R.E. STORES DEPOT, 27A, CAMPBELL ROAD, BOW, E.

Ref. D.D. 8/Group 477

Bibcocks.	1¼" brass screw down, screwed for iron, tested 300 lbs. per sq. in.,	225	"
Bibcocks.	½" ditto	6,975	"
Stopcocks.	Brass 2" screw-down both ends,	28.	"
Stopcocks.	1½" ditto	7,411	"
Stopcocks.	1" ditto	1,321	"
Stopcocks.	¾" ditto	2,542	"
Stopcocks.	½" ditto	217	"
Valves.	Ball 1¼" screwed for iron pipe with copper ball complete, tested, 300 lbs. per sq. inch	854	"
Valves.	Ball 1¼" ditto	40	"
Valves.	Ball 1" ditto	190	"
Valves.	Ball ½" ditto	192	"
Valves.	Reflux 2" with c.i. body and g.m. faces, and undrilled flanged ends	317	"

Further Particulars and Tender Forms may be had on application to the CONTROLLER, Factory, Consumable Stores Section, Government Disposal Board, 37/41, Old Queen Street, Westminster, S.W. 1. Please quote references. 5744

FOR SALE.—*Continued.*

ROTARY CONVERTER, &c., FOR SALE.

ONE ROTARY CONVERTER by Vickers, Ltd., 85 volts, three-phase, 50 periods to 110 volts, direct-current, 150 KW. Complete with switchboard by Ferguson, Pailin & Co., Manchester.

One Transformer for above by Ferranti, Ltd.; 150 KW., 2500/85 volts, three-phase, 50 periods.

One High-Tension Cubicle for above by Ferranti, Ltd.

Price for the whole complete, £750.

THE PHŒNIX ELECTRICAL CO.,
32/36, Broomielaw,
Glasgow. 5224

FOR SALE.

16-H.P., 220-volt, slow-speed Holmes Motor, semi-enclosed, 6-pole, compound wound, 350 revs.

Electric Saw Bench, with 3½-H.P., 460-volt, D.C. enclosed Motor, &c., to take 20" saws.

48-KW., 120-volt, 4-pole, shunt-wound Generator, 3-bearing type, with slide rails.

300-amp., 70-volt, bi-polar, compound-wound Dynamo, by Holmes, speed 900, perfect order.

4-H.P., 110-volt, compound-wound Motor, by Holmes, slow speed, 300 revs.—DRUMMOND & Co., Middlesbrough. 5121

MOTOR-BOOSTER SET.

OFFERS are invited for one new Crompton Motor-Booster Set, comprising of :—Two open-bracket type continuous-current Interpole Machines, mounted on a substantial cast-iron under-bed. The Motor is shunt wound to work on a 230/250-volt circuit; the Booster is capable of giving continuously an output of 150 amperes at 100 volts, or 200 amperes at 70 volts maximum, and is arranged for separate excitation at 230/250 volts; speed of Set is approximately 1250 R.P.M. This Set has not been used.

5589, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

TWO ZOELLY-SIEMENS TURBO SETS.

COMPLETE WITH CONDENSING PLANT.

First-class condition. Normal steam consumption.

Nominal rating 400 KW., three-phase, 500 volts,

50 periods, 3,000 revs.

Capable of 600 KW. continuously.

May be seen on full load.

R. S. GREENHALGH, Consulting Engineer, Atherton. 5619

CUNNINGHAM'S REGISTER.

A REGISTER OF MOTORS, &c., for sale and wanted. Send particulars of YOUR NEEDS (as a buyer or seller). MOTORS rewound and repaired.

171, Edgware Road,
'Phone : Padd. 5173. London, W. 2.

GENERATING SET.

A FINE 70-KW. Generating Set, comprising Two-crank enclosed high-speed Compound Engine, by Ruston, Proctor & Co., Ltd. Direct coupled to D.C. Generator, 230 volts, 300 amps., 450 r.p.m. Mounted on self-contained bedplate. A first-class set, in stock ready for delivery.

THOMAS MITCHELL & SONS, LTD., Edgar Street, Bolton.
Telegrams : "Realize." Telephone : 302. 5612

FOR SALE.

150-KW. or 220-KW. Willans-Crompton non-condensing Generating Sets, 160 lbs. steam pressure superheated. Dynamo 420/450 volts. One Set has double commutator giving 210/225 volts or 420/450 volts. Can be seen running under load at any time.

5583, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

FOR SALE.

VICTORIA Dynamo, protected type 220 volts. D.C. 205 amps., 860 revs. Siemens Dynamo protected type 220 volts. D.C. 9 amps., 1240 revs. Main switch panel fitted with voltmeter, shunt regulator, circuit switches, &c. Two 3-H.P. D.C. motors 220 volts, shunt wound, with starters and switches. Three 7½-H.P. motors 220 volts, shunt wound, with starters and switches.

H. O. STRONG & SONS, LTD., Norfolk Works, Bristol. 8715

ELECTRIC DYNAMOS AND MOTORS.

MACHINES always available for Sale or hire. ARMATURES and FIELD COILS rewound or repaired without delay.

'Phone : 5773 Holborn. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C. 1. 8488

(*Continued on next page.*)

FOR SALE.—*Continued.*

GENERATING SETS FOR SALE.

TWO modern 300 KW., 230 volts, D.C. high speed enclosed compound Sets, with Switchboard, &c. At present working, but available immediately if required.

Address—

5421, ELECTRICAL REVIEW,
4, Ludgate Hill, London, E.C. 4.

MOTORS IN STOCK.—FOR SALE OR HIRE.

17-H.P., single-phase, Fuller, 200-v., 50 periods, slip-ring.
3-H.P., two-phase, American G.E.C., 220 volts, 60 periods.
5-H.P., three-phase, E.C.C., 200 volts, 50 periods, 950 r.p.m.
30-H.P. Mavor Coulson, D.C., 440 volts, 650 r.p.m.
10-H.P. Cutting, D.C., 440 volts, 700 r.p.m.
Crypto Rotary Convertor, 480 volts, D.C., 60 volts, 60 amps.
5-H.P. Woolnough, D.C., 110 volt, 700 r.p.m., and 50 other Motors.
E. P. ALLAM & CO., 107/109, Gray's Inn Road, W.C. 1. 3647

CARBON FILAMENT LAMPS.

17,000—starting from 55 to 250 volts—of assorted candle-power. Forward your requirements, stating plainly quantity required, voltage and candle-power.

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FOR SALE, two 12·5 KW. Lighting Sets consisting of high-speed Marshall vertical steam engines, coupled direct to Crocker, Wheeler 8-pole dynamos, 145 volts, 90 amps., 275 revs.; very high-class sets, ex-country house.

JOSEPH PUGSLEY & SONS, LTD.,
Cattybrook Iron Works, Lawrence Hill, Bristol. 5715

Cheap prepaid Advertisements are inserted under this heading.

TRADE RATES ON APPLICATION.

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A DIRECT-Current Interpole Motor, 15 H.P., 220 volts, 930 revolutions, by Verity; nearly as new; immediate delivery.—8837, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CABLE, new Association Grade, for immediate disposal; 1320 yards 37/14 S.W.G., 600 megohms V.I.R. braided.—J. McGregor & Co., 74, York Street, Glasgow. 8719

DIRECT-COUPLED Steam Sets (3), each 96 KW., 460 volts D.C.; enclosed Compound Engines, coupled to multipolar Generators. Good condition, for immediate delivery.—Harry H. Gardam & Co., Ltd., Staines. 4772

ELECTRIC Motors (200) for sale, ¼ H.P. to 100 H.P., A.C. and D.C.; immediate delivery. Send your enquiry before placing your orders elsewhere. 'Phone East Ham 693.—Sugden, Wakering Road, Barking. 5739

FIVE ¾-H.P. D.C. Electric Motors, by Electromotors, Ltd., 220 volts, 3 amps., 900 revs.; one ¾-H.P. ditto, 700 revs £25 each, good condition; inspection invited.—Apply W. P. Griffith & Sons, Ltd., Printers and Stationers, 120, Coldharbour Lane, S.E. 8812

FOR Sale, a Prescot No. 52 Tube Welding Machine, by B. I. and Helsby Cables, Ltd. Price £50.—The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5221

FOR Sale, approximately 10 tons 30's Tinned Soft Copper Wire in coils.—Offers to 5711, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Complete Plant, consisting of 54 LL 17 D.P. Cells; Elwell-Parker Dynamo, 150 v., 50 a.; 12-H.P. (nominal) Marshall Steam Engine; Switchboard, &c. Also one 5-way D.P. Switch and Fuse Board, 100 amps. per way, in teak case, condition as new; 110 yards 14-way lead-covered Telephone Cable and 100 yards 14-way ditto, braided.—Felgate Electrical Co., Merchant's Place, Reading. 5737

FOR Sale, Crossley Gas Engine, 20 H.P., complete, three tanks, self-starter, and usual fittings. In good order. £75.—W. Perkins, 79, Sutherland Road, West Croydon. 8845

FOR Sale, eight new 800/1400-ampere, D.C., Circuit Breakers' by Bertram Thomas. £18 each.—The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5569

FOR SALE.—*Continued.*

FOR Sale, Electric Motors; three 15-H.P., G.E.C., absolutely new. 440 volts, 960 revs., 50 cycles, pulley and starter. Immediate delivery.—A. Underwood, 3, Queen Street, E.C. 4. 8865

FOR Sale five Arc Lamp Pillars, handsome design (by Macfarlane and Co., Glasgow), condition as new, height 22′ from ground line to centre of arc complete with single swan-neck brackets, 3′ projection; also two brackets; 2′ projection for incandescent lights, 11′ from ground.—Apply Borough Electrical Engineer, Corporation Electricity Works, Bury St. Edmund's. 5594

FOR Sale, four 50 H.P., 250 volt, D.C. Motors, by B.T.H. Co., with Brookhirst Panels. £170 each.—Phœnix, 32, Broomielaw, Glasgow. 5727

FOR Sale, high speed compound enclosed Engine, complete with all accessories, by Browett, Lindley, 250/300 H.P., 270/375 R.P.M., with relay governor and surface condenser, new 1913, being substituted by motor. Can be seen running by appointment.—Apply, Hull Forge Iron & Steel Company, Limited, Hull. 8692

FOR Sale, Jackson Electrical Oven and Carving Table, with switch complete, price £18.—Apply Watkins and Shaw, Ltd., 40/42, Golders Green Road, N.W. 8653

FOR Sale, Motor Generators, variable speeds, inter-poles; Generator, 270 volts, 1,000 amps.; Motor, 200 volts, 1,250 amps., speed 300/330 R.P.M. Also Motor-Generator, Generator 320 volts, 210 amps., Motor 330 volts, speed 375/475 R.P.M. For further particulars write—"GENERATORS," c/o Tayler's, 30, Fleet Street, E.C. 4. 8813

FOR Sale, one 5-H.P., Steam Engine, vertical, for direct coupling to dynamo, fan or pump, condition as new.—Matson, 69, Ewbank Street, Stockton-on-Tees. 8740

FOR Sale, Peace Signs: Letters G.R. 3 ft. with crown £10, Box Sign Photos King and Queen £4, Star 25 lamps £3, Crown 15 lamps £3. The property of a soldier who died in France.—8835, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, six 50-H.P., 2-phase, Squirrel Cage Induction Motors, 50 cycles, 720 r.p.m., 400 or 200 volts, complete with auto-starters. Practically new.—R. F. Winder, Cross Belgrave Street, Leeds. 4677

FOR Sale, three 35-H.P., 480-volt, D.C. Motors, complete with starters, £125 each.—The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5222

FOR Sale, two Electrical Spot Welding Machines, by B. I. and Helsby Cables, Ltd., with rotary converters, 220 volts, D.C. to 130 volts, single-phase, 12 KW., £85 each.—Phœnix, 32, Broomielaw, Glasgow. 5386

FOR Sale, two sets of second-hand Intercom. Telephones of good make. Good condition.—Particulars upon application to 8843, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, two 20-H.P., 230-volt, 320/960 R.P.M., enclosed-ventilated Motors, by Electromotors, Ltd., with starters; two 30-H.P. do.; also 30 and 40-H.P., 250-volt, 725 R.P.M. Motors, by Phœnix Dynamo Mfg. Co.—Phœnix, 32, Broomielaw, Glasgow. 5384

FOR Sale, two 190-KW., 220-volt, 400 R.P.M., multipolar, 3-bearing, rope-driven Generators with panels. Would make good 220-H.P. motors. £375 each.—The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5568

FOR Sale, 5-ton Electric Lorry, fitted with flat lorry body and driver's cab. Chloride battery. In excellent condition.—Particulars, &c., 8798, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 6-H.P., 220-volt, D.C., totally-enclosed Cuttings Motor, 720 R.P.M., 4-pole, shunt-wound, as good condition as new; very little used, new in 1916; with rails, D.A. enclosed starter, ironclad switch and fuses mounted on iron frame, £75.—Bernard Meggitt, Mansfield. 8711

FOR Sale, 60-H.P., 400-volt, 25-cycle, 475 R.P.M., three-phase, slip-ring Motors, by B.T.H., with starting gear; nearly new.—Phœnix 32, Broomielaw, Glasgow. 5387

FOR Sale, 100 K.V.A., 5000/110 volt, 3-phase, 25 period, oil cooled Transformer with Switchboard. All quite new and in original packing cases. £140.—Phœnix, 32, Broomielaw, Glasgow. 5728

FOR Sale, 400/440-volt, 50-cycle, three-phase Motors, 50 H.P., £135; 75 H.P. £180; 100 H.P., £225.—Phœnix, 32, Broomielaw, Glasgow. 5385

(*Continued on next page.*)

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FOR SALE.—*Continued.*

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FOR Sale, 500/600-volt, 50-period, 3-phase Motors; 12½, 45, 60, 100 and 200 H.P.—The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5566

FOR Sale, 1000-KW., 500-volt, direct-current Turbo Set, complete with surface condenser and motor-driven pumps. New in 1913. —The Phœnix Electrical Co., 32/36, Broomielaw, Glasgow. 5567

ILLUMINATIONS.—Two thousand Lamps and Holders, wired in strips of 8; in series on 100 v. or 110 v.—D. Assersohn, 31, St. Bride Street, London, E.C. 4. 8842

MOTOR (new) 75-H.P. Brook, three-phase slip ring, 25 cycles, 440 volts, 720 revs. Complete with third bearing. Liquid rotor starter and Ellison switch.—Harrison & Company, Bradford Street, Birmingham. 5672

ONE B.T.H. Motor, 1 H.P., 440 volts, D.C., 1550 R.P.M., complete with starter, fitted with overload and no-volt release; perfectly new.—Hercules, Ltd., Conybere Street, Birmingham. 5730

ONE 100-H.P. Motor by Electrical Co., 480 R.P.M., 650 volts, 50 periods, complete with H.T. switch and starter, in good condition. £200 or best offer.—Ferranti, Ltd., Hollinwood. 5666

ONE 200-KW. steam Generating Set for immediate sale, Willans-Mather & Platt, 220 or 440 volts. Complete. Quantity of spare parts and instruments for panels. Perfect working condition.—Jennings, West Walls, Newcastle-on-Tyne. 4757

PEACE Celebrations.—About 3 miles Electric Cable, at job prices, suitable for above; various small sizes cheap.—Lake, 132, Upper Thames Street, London, E.C. 8831

PEACE Illuminations.—Quantity 7/20 Illumination V.I.R. Strip, mounted with holders, 18 ins. apart; delivery from stock.—Apply Connolly, 38, Caxton House, Westminster, S.W. 8867

SILENCE Cabinet, polished teak, constructed for ½-KW. Marconi wireless installation; made in sections for easy transport. Solid brass door fittings, dimensions inside 2' 4" × 2' 4" × 2' 6"; price f.o.r. Glasgow £15.—R. B. G., 5, Lloyds Avenue, E.C. 3. 8634

SINGLE-Phase repulsion Induction Motor for Sale, with heavy Commutator and slip-rings fitted, and latest brushgear, 100 volts, 50 periods, 940 revs. Perfect condition.—Gill, 49, Winchester Avenue, Leicester. 8705

STEAM Set, 130 H.P., 2 Cylinders compound, for 150 lbs. steam pressure, by Beilias & Co., 1899; direct coupled to generator, D.C., 100 KW., 110 volts, 450 R.P.M., by Crompton & Co., 1916; with vertical Boiler 300/400 lbs. capacity, 60 lbs. pressure.—Reply, Hoffmann Manufacturing Co., Chelmsford. 5626

STOCKS and Dies, sets of ¼-in. and ½-in., electric thread, supplied from stock; single complete sets 39s. 6d., carriage paid; standard electric thread for conduit, sets of ½ in., ¾ in. and ¾ in., complete 43s. per set; stocks, 16s. 6d. each; dies, 7s. 3d. each; guides, 2s. each; sets of ¼ in., 1 in. and 1¼ in., complete. 60s. per set; stocks, 21s. each; dies, 10s. each; guides, 4s. each. Deliveries from stock. Enquiries solicited from retailers. Subject to discount.—Grove Park Electrical Agency, 16, Grove Park Gardens, Chiswick. 8407

VERTICAL Motor by Lancashire Dynamo & Motor Co., 3½ H.P., compound wound, 460 volts, 600 R.P.M., condition exceptionally good, no reasonable offer refused.—Smith, 66, Holyhead Road, Wednesbury. 8726

1-TON Wharf Crane, electric, by Taylor & Hubbard, complete with cabin, lifting and slewing gear and 10-H.P. Motor.—Albert Morgan, 138, Gower Street, W.C. 1. 'Phone Museum 3418. 8829

5-H.P. "PETTER" Oil Engine; "Newton" Dynamo, 35/50 amps., 50/75 volts, with switchgear. New condition.—Fisher, 11, High Street, Doncaster. 8827

5-H.P. 100-volt A.C. slip-ring Motor, 50 periods, single-phase, with rails, pulley, and starter; 50-amp. D.P. Switch and Cut-outs.—Price for whole, or part, to Wilde, 73, High Street, Sydenham, S.E. Phone 1223. 8868

20-H.P., 220-v. Motor, £65; 30-H.P. ditto, £98; rails, pulleys and starters; nearly new machines.—140, Southwark Street, London. 8782

70-KW. Direct-Coupled Steam Set, by Allens, of Bedford, 100-120 volts, D.C. enclosed engine, multipolar, compound-wound generator.—Harry H. Gardam & Co., Ltd., Staines. 5215

90-B.H.P. Hornsby Gas Engine, new 1910, with 65-KW. Crompton Interpole Generator, 230-volt D.C., new last year and never used; sell together or separately.—Harry H. Gardam & Co., Ltd., Staines. 5575

600-B.H.P. High-speed Vertical, enclosed type Engine, by Allen's, of Bedford, coupled to Alternator, by Westinghouse, 440 volts, 60 periods, 3-phase; or would sell engine separately.—HARRY H. GARDAM & CO. LTD., Staines. 4771

BUSINESSES FOR SALE AND WANTED.

ELECTRICAL Contracting Business (principally for trade), with wholesale factoring department in central London district for sale; old-established business capable of big expansion. Good reasons for selling.—For particulars apply Coad & Co., Solicitors, 27, Old Jewry, London, E.C. 8779

ARTICLES WANTED.

Cheap prepaid Advertisements are inserted under this heading.

TRADE RATES ON APPLICATION.

Box Number and ELECTRICAL REVIEW address count as seven words.

A. LEAROYD & SON, Bridge Works, Clapton, N.E.—Telephone: Dalston 2278; Telegrams: "Frangible, Lowlap, London" buys for prompt cash every description of second-hand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable Scrap Metals, Metallic Drosses, &c., &c. Inquiries solicited. Established over 50 years. 7839

A.C. and D.C. Motors (second-hand, any type, any condition, wanted for prompt cash.—A. Learoyd & Son, Bridge Works, Heatherley Street, Clapton, N.E. 7838

ADVERTISER is requiring Electric Oven for graphitising carbon electrodes.—Communicate in first instance to 5687, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRIC Drills and Grinders, 250 volts, D.C., 500 volts, Megger, 230 and 460 volts, D.C., motors.—Condition and price to Drake & Fletcher, Maidstone. 8799

ELECTRIC Motors wanted, 10, 20, and 50 H.P., 415 volts, 50 periods, 3-phase, A.C. supply.—8821, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MOTORS wanted.—One 50-H.P., 950 revs., 440 volts, D.C.; one 150-H.P., 25 cycles, 440 volts, 1,000 revs., A.C.; two 75-H.P., 440 volts, 450 revs., 25 cycles, A.C.; with Starters and Switches complete.—8826, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLATINUM Scrap wanted for spot cash. We purchase Platinum and give the highest market price. Call and be convinced before selling elsewhere. Parcels by post, prompt cash per return. The original firm.—The Depôt, 156, Charing Cross Road, London, W. Established 1850. 8725

REQUIRED urgently, Motor Generator or Rotary, to convert 460 D.C. to 6,600 volts A.C., 50 periods. Capacity about 250 KW.—Murray Coombs & Richards, 25, Victoria Street, S.W. 1. 8718

TELEPHONE Switchboard.—Wanted 50-line standard magneto switchboard for metallic or earth circuits. Fitted with hand-restoring drops. 10 pairs of cord, listening and ringing keys, operators' set, &c. Old Nat. Tel. Co.'s type preferred.—Full particulars, price, &c., to 5678, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TURBO-Generator Plant.—Wanted for quick delivery, one or two Turbo-Generator Sets (new or second-hand). 3-phase, A.C., 6600 volts, 50 periods. Offers will be considered for sets of 1000 KW., 1500 KW. and 2000 KW. State price, condition of plant and where seen.—Offers to 5732, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a number of Potter & Johnson Automatics, preferably size 3A. Must be in good condition.—Write, stating particulars and price, to "Size," c/o Tayler's, 30, Fleet Street, E.C. 4. 8814

WANTED, Electrical Sets, all sizes, Boilers, Accumulators Dynamos, Motors, &c.; also Scrap Cable and Metals Complete Plants purchased.—Williams & Sons, 37, Queen Victoria Street, London, E.C. 4. Telephones: 3938 City and 834 Hop. 3800

WANTED, Galvanometer Q and I or 3-coil.—Sidney & Ellis, 12, Barton Street, Bath. 8769

WANTED, good second-hand Motor, 100 volts, continuous current at 2/3 H.P., speed not to exceed 900 revs.—Full particulars to Mason & Brown, Vestry Street, Leicester. 8818

WANTED, Megger Insulation Testing Set, 500 volts. Must be in perfect order. Prompt cash.—5670, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARTICLES WANTED.—*Continued.*

WANTED, one Converter, single machine, D.C. both sides, 240 volts input, output 50 amps. 70 volts, or Motor-Generator set equivalent.—8809, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, one or two old Tramcar Bodies, with windows; state size, price f.o.r. — "Standhardwear," Alexandria, Dumbartonshire. 8698

WANTED, one 250-KW., 200 volts, 2-phase, 50 periods, Alternator; also Motors, 5/25 H.P., same particulars.—R. F. Winder, Belgrave Electrical Works, Leeds. 5719

WANTED, one 500-KW. Steam Set. 220 volts, continuous 140 lb. pressure, new or second-hand, early delivery essential.—The London & Rugby Engineering Co., Ltd., 36, Queen Street, London, E.C. 4. 5521

WANTED, shunt-wound Dynamo, output about 80 volts, 20 amperes, with shunt regulator.—Send full particulars and prices to E. T. Mackrill & Sons, Aylesbury. 5743

WANTED, steam Generating Set; engine, Belliss, Browett, or Allen; generator, direct current, 220/250 volts; capacity, 70/200 KW., or 3-phase, 50 cycles, 400 volts.—State price and where can be seen to 5690, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, ¼-H.P. Motor, 230 volt D.C.; also portable Voltmeter up to 230 volts and portable Ammeter up to 100 amperes.—5, Wellowgate, Grimsby. 8828

WANTED 5 H.P. 440 volts and a 2½ H.P. 220 volts D.C. Motors.—Apply Geo. Morrison, 24, Birley Street, Blackpool. 5726

WANTED, 40 H.P., A.C. Motor, 400 v., single-phase, 60 periods, slip-ring.—Price and particulars, Ruff, 35, Verulam Street, E.C. 1. 8797

WANTED, 40/50-KW. direct-current Dynamo, 200/230 volts, for direct-coupling to Pelton wheel, speed about 700/750.—J. Pullar Phibbs, Limited, North Strand, Dublin. 5540

WANTED, 150-KW., 110-volt, D.C. Motor, speed 360 R.P.M.; or alternatively a 150-KW., 220-volt, D.C. Motor, speed 180 R.P.M. Must be in good condition.—5693, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MISCELLANEOUS.

NOTICE OF REMOVAL.

C. ORGEL, Wholesale and Export Electrical and Motor Accessories, begs to notify the Trade that he has secured larger and more convenient premises at

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CHURCH Bells.—A Belgian firm would like to come in touch with a British firm having as speciality the production of electrical machinery to replace manual labour in ringing church bells.—Write to Société Belge d'Electricité, 23, Rue de la Caserne, Bruxelles. 8806

ELECTRIC Truck and Vehicle Makers, kindly forward catalogues, descriptive matter, running costs, &c., to prospective buyer.—8685, ELECTRICAL REVIEW, 4, Ludgate Hill, London

FIRM of Electrical Engineers, established 1897, are open to receive samples of any domestic labour-saving device. Large showrooms in Southport and stores in Manchester.—F. W. Smith and Co., Ltd., 40, John Dalton Street, Manchester. 5671

MISCELLANEOUS.—*Continued.*

MESSRS. H. Sloog's offices have now been removed from 51, Anson Road, N.W. 2, to 45, Great Marlborough Street, W. 1. Telephone Regent 2460. All communications should henceforward be sent to the new address. 5733

OVERHAUL and Rewinds of Small Machines; A.C. and D.C. Quick despatch.—8207, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHEET Metal Work wanted, any kind; best workmanship at moderate prices.—A. V., 26, Pindar Street, Bishopsgate, London, E.C. 8853

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Fourth Edition Revised.

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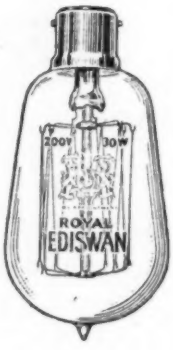

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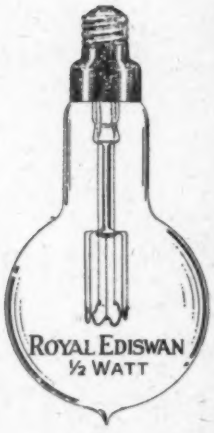

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DISPLAYED ADVERTISEMENTS

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FRIDAY.

The ELECTRICAL REVIEW is the recognised Medium of the Electrical Trades, and has BY FAR THE LARGEST CIRCULATION of any Electrical Industrial Paper in Great Britain.

NOTICES RELATING TO PATENTS.

Latest time for receiving, 5 p. m. Wednesday.

John E. Raworth & Moss,

Queen Anne's Chambers, 28, The Broadway, Westminster, S.W. 1. **Chartered Patent Agents.**

TO ELECTRICAL ENGINEERS.

THE Owner of Patent No. 28 630, of 1913, relating to "Electrolytic Converter for the Transformation of Alternating Currents into Continuous Currents," is desirous of entering into arrangements by way of licence or otherwise on reasonable terms for the purpose of practically working and exploiting the invention in this country.—For particulars address Messrs. ALLIS N BROS., 84-86, Chancery Lane, W.C. 2. 5701

TO LAMPHOLDER MAKERS, MANUFACTURING ENGINEERS & OTHERS.

IMPROVED LAMPHOLDER, where risks of short-circuiting are reduced to a minimum, or 100 per cent. guaranteed safety over any lampholder now made; can also be used for locking the lamp without additional cost. These two advantages put the holder in front of any yet on the market. Patented Great Britain, France, Australia. Manufacturing Rights or Patents for Sale.

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OFFICIAL NOTICES.

Latest time for receiving, 5 p.m. Wednesday.

BOROUGH OF BEDFORD ELECTRICITY DEPARTMENT.

TENDERS are invited from Manufacturers for the supply, delivery and erection of the following plant:—

Contract No. 7.—Buildings.
Contract No. 8.—Electric Motors, &c.
Contract No. 9.—Coal Conveyor, Runway and Chutes.

Specifications and full particulars may be obtained from the undersigned on receipt of a deposit of £1 in respect to each Contract. Deposits will be returned on receipt of *bona-fide* Tenders.

Sealed Tenders, endorsed Contract No. . . . addressed to the Chairman of the Electricity Committee, Electricity Works, Cauldwell Road, Bedford, are to be delivered before noon on MONDAY, JULY 21st, 1919.

The Corporation does not bind itself to accept the lowest or any Tender.

(Signed) R. W. L. PHILLIPS,
Borough Electrical Engineer. 5720

ELECTRICAL REVIEW.

BINDINGS AND CASES.—Subscribers and others can have their half-yearly numbers bound handsomely in Black Cloth at the rate of 6/6 per Volume, including Index. Cases for binding are also supplied at 4/6 each, Indices 3d. each.

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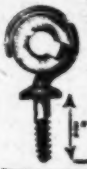

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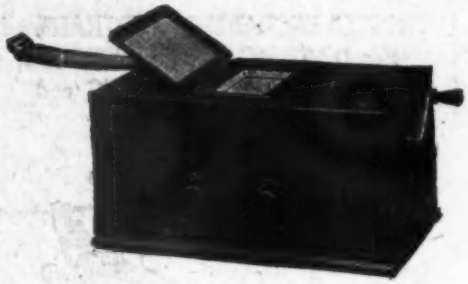

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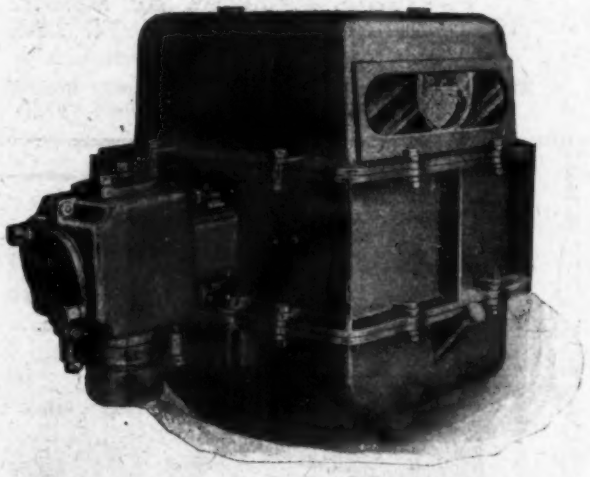

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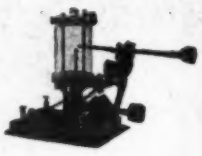

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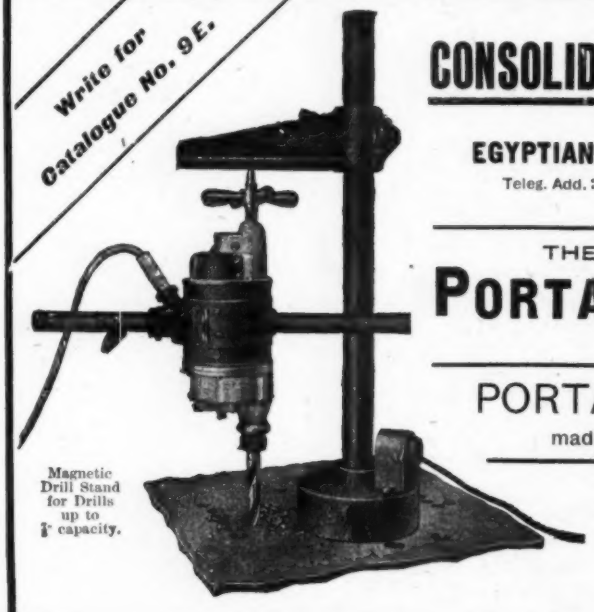

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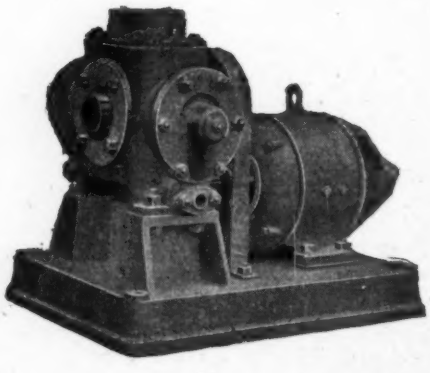

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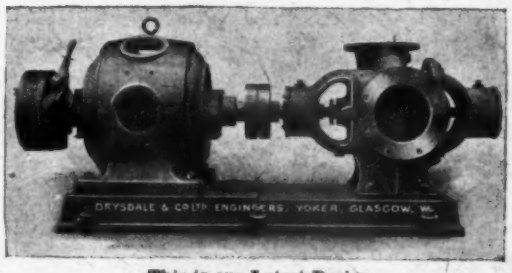

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FERRANTI A. C. METERS.

The following leading article appeared in the "Electrical Review," May 2nd, 1919:—

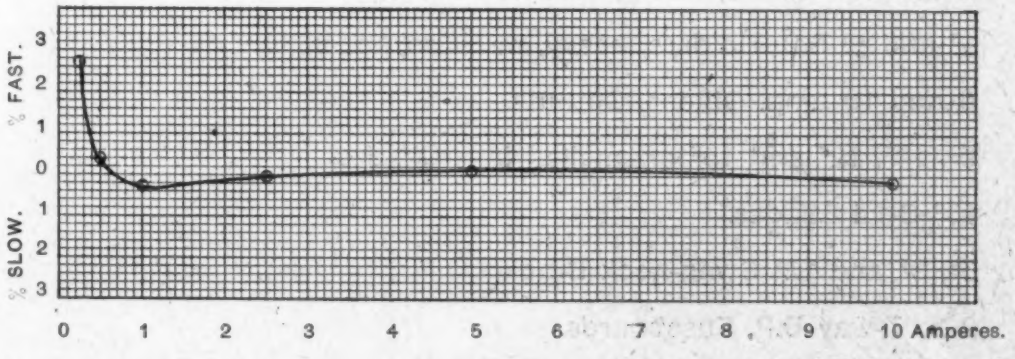
Watch the Meters.

It is, perhaps, not sufficiently realised, especially by the smaller electricity supply undertakings, that the question of metering the energy supplied to consumers is one of the most crucial factors in the whole business. *Every unit not properly metered is a dead loss in money to the undertaking.* An all-round lack of accuracy of the meters would thus seriously affect the revenue. Further, it has to be recognised that this is not a case where inaccuracy in one direction can be set off against inaccuracy in another. Assuming that a meter is correct to start with, the tendency is for the meter to go slow, seeing that this is a natural result of increase in friction. The tendency to develop over-registration is rarely met with, and is, in fact, practically impossible on many types of meters.

It may be taken, therefore, that the faults developing on meters are all on the side of the consumer, and against the undertaking. One very general fault is for a meter to get into the condition of not starting on a low load. With the low-wattage lamps now in use, a corresponding demand is made on the meter for efficiency in this direction. It is a most common fault for meters not to start with one lamp, and this with thousands of consumers would become, in the course of a year, quite a serious matter. Further, by the nature of the case, this fault operates on high-priced units, namely, the lighting supply. As a case in point, some years ago a large London undertaking found that, although it was developing rapidly, there was not a proportionate advance in the revenue, and it was decided to inaugurate a thorough-going meter department. Within the next year or so following the overhauling and accurate adjustment of the meters, they brought in an extra revenue far and away outstripping the expenses incurred. One of the new steps taken in this case was that the meters were changed about every three years, instead of being left out on circuit almost indefinitely. In some small undertakings, even at the present day, meters are installed and left without attention for years. There has, in fact, been a case in which the meters in an undertaking were allowed to go wrong so far as to attract attention through a noticeable and wholesale falling off in the revenue. Of course, if the station meters are kept in order, and the total of the consumers' meters checked thereby, after making allowances for distribution and other losses, a check is readily obtained. The item of "units unaccounted for" reflects the efficiency of the meters, and in some cases one may guess from this where there is a "top-hole" meter department. Perhaps the fact of the meters being looked upon as merely part of the mechanical apparatus coming under the control of the engineer, has caused their direct relation to the revenue to be overlooked by the management. Now the whole question is one of crucial importance to supply undertakings. Curiously, in Mr. Seabrook's otherwise excellent book on the "Management of Public Electric Supply Undertakings," there is a lack of stress in emphasising this point. The subject of testing and repairing meters is dismissed with the statement that "the Meter Department will require well-equipped testing and repair rooms." Whatever may be conveyed *implicitly* by this, to drive in *some* truths requires a sledge hammer.

TYPICAL ACCURACY CURVE.

METER No. 500144, 10 AMPERES, 200 VOLTS, 50 PERIODS.



The importance of sustained accuracy at low loads and low-starting current is emphasised by the *Electrical Review*, and the above curve shows that Ferranti A.C. Meters tend to run fast on low roads, and are thus admirably adapted to give satisfaction in these respects.

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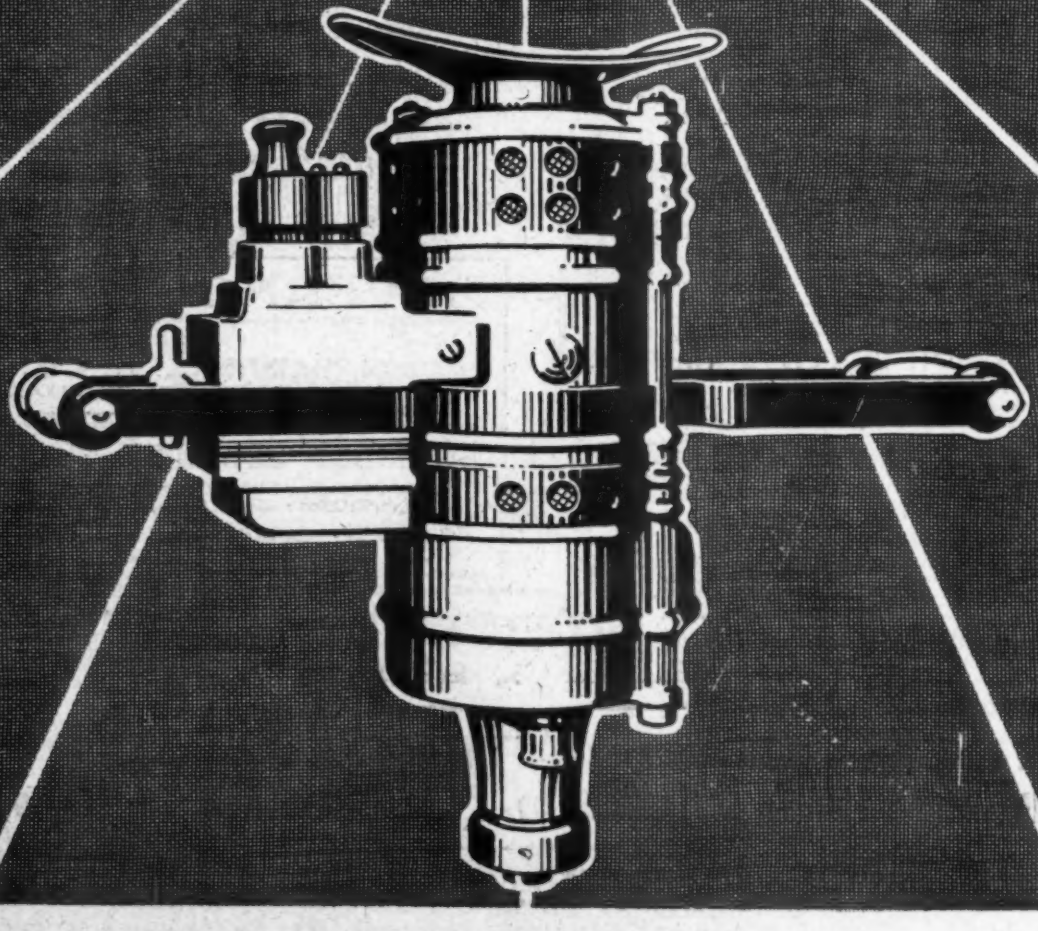

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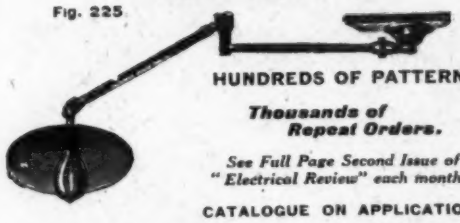
Fig. 225



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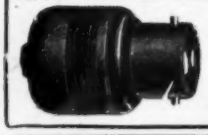

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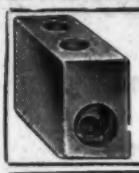

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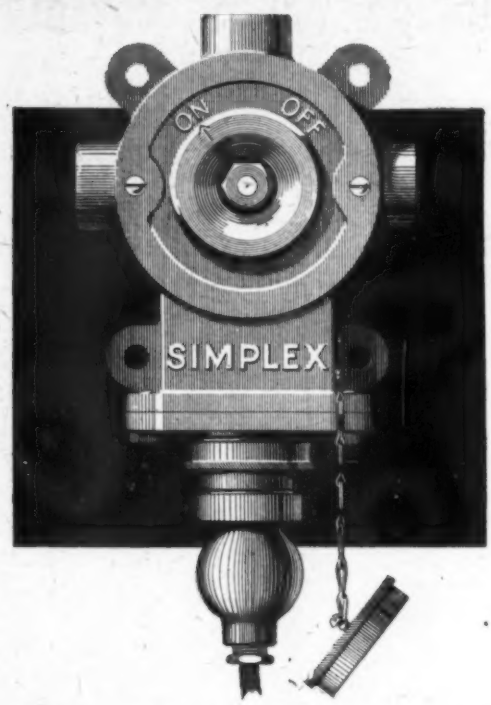

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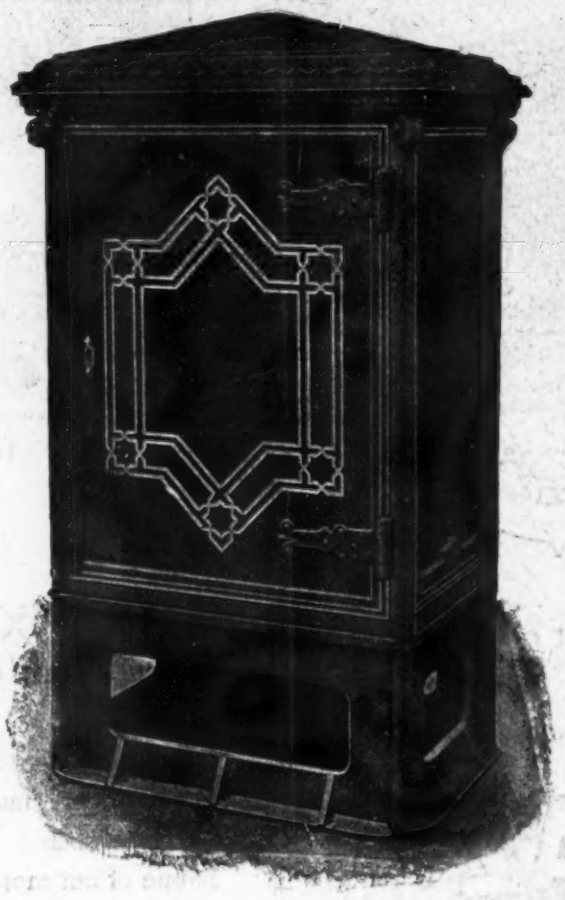

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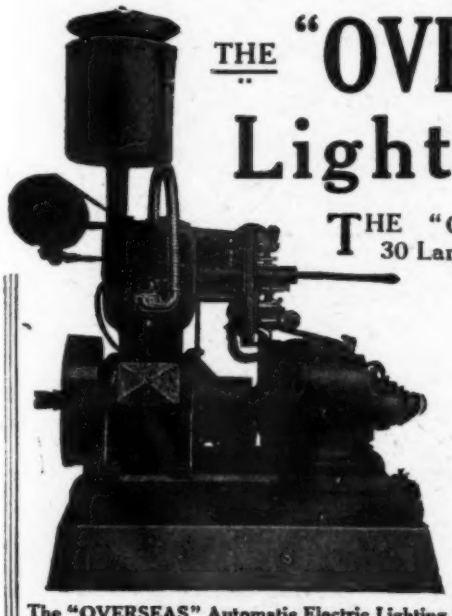

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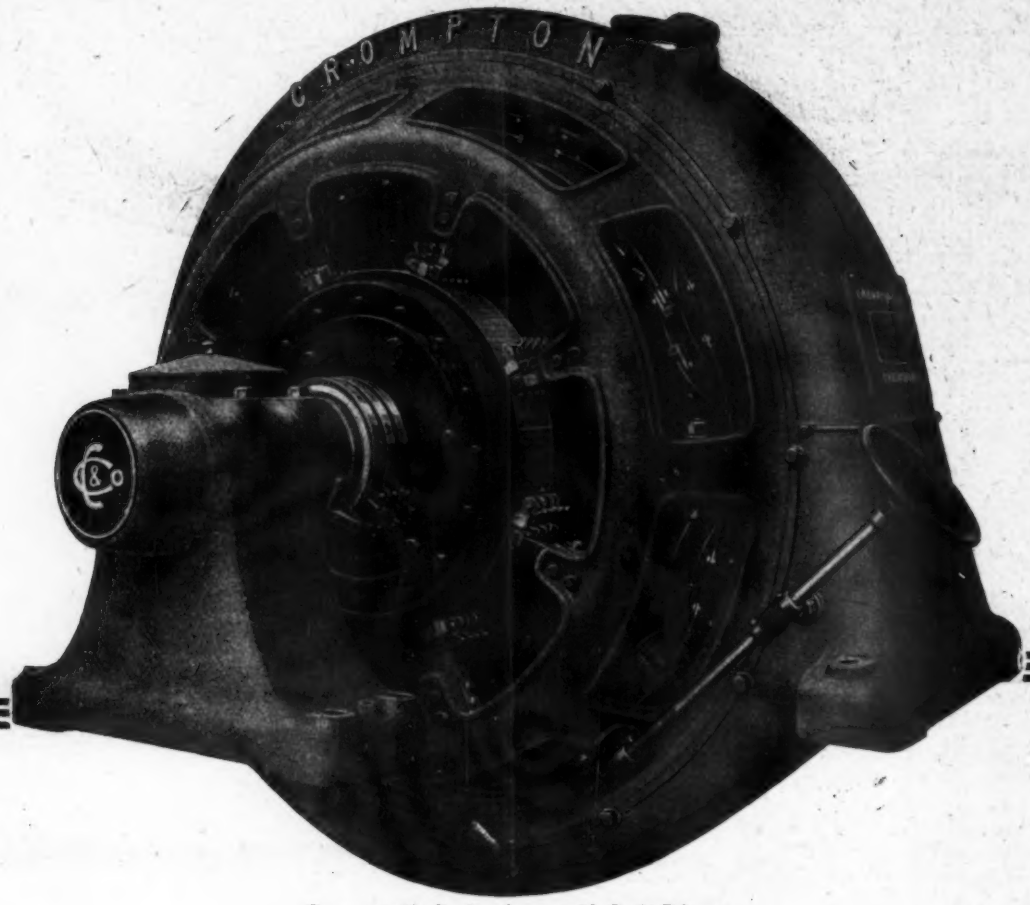

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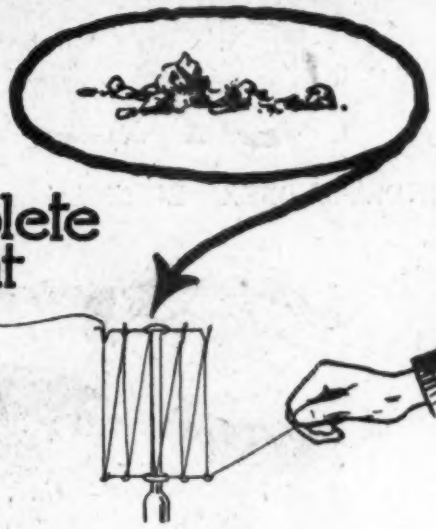

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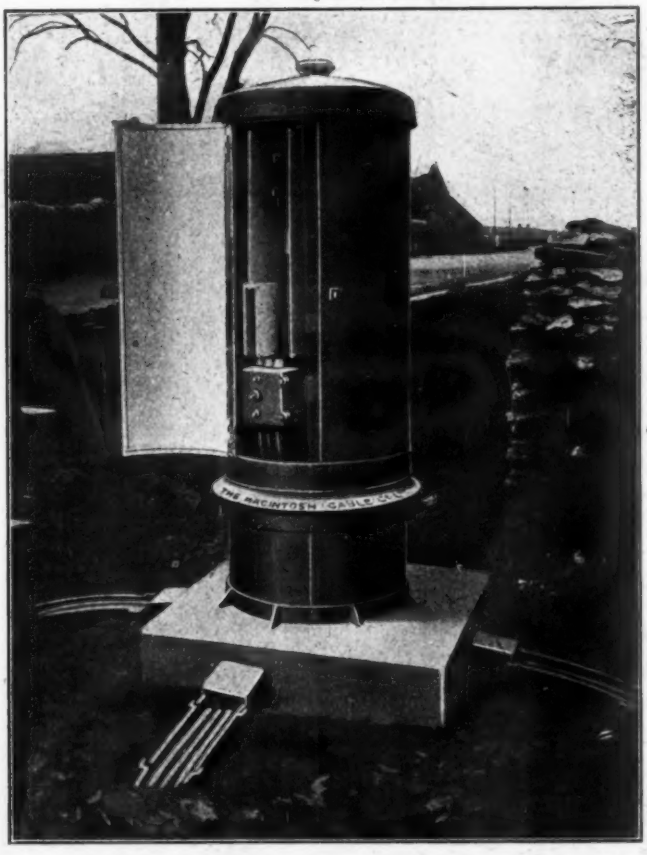

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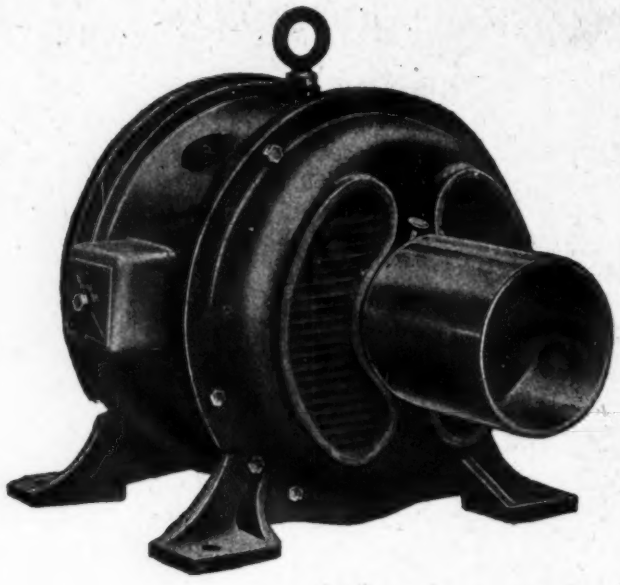

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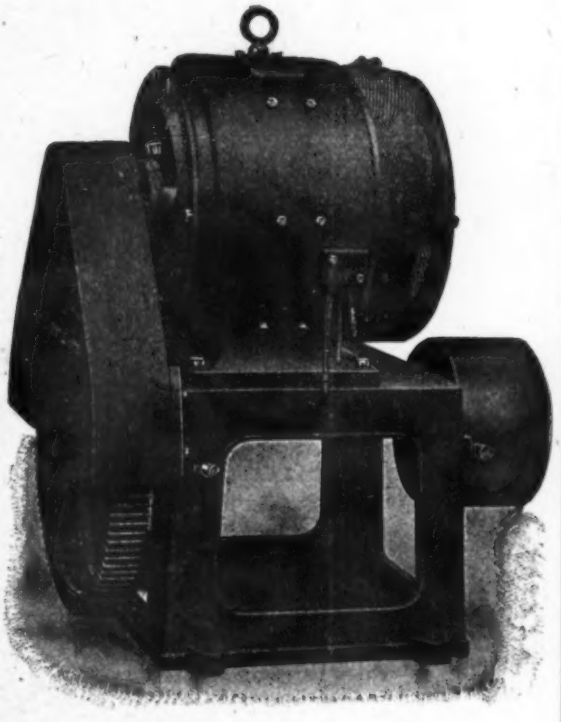

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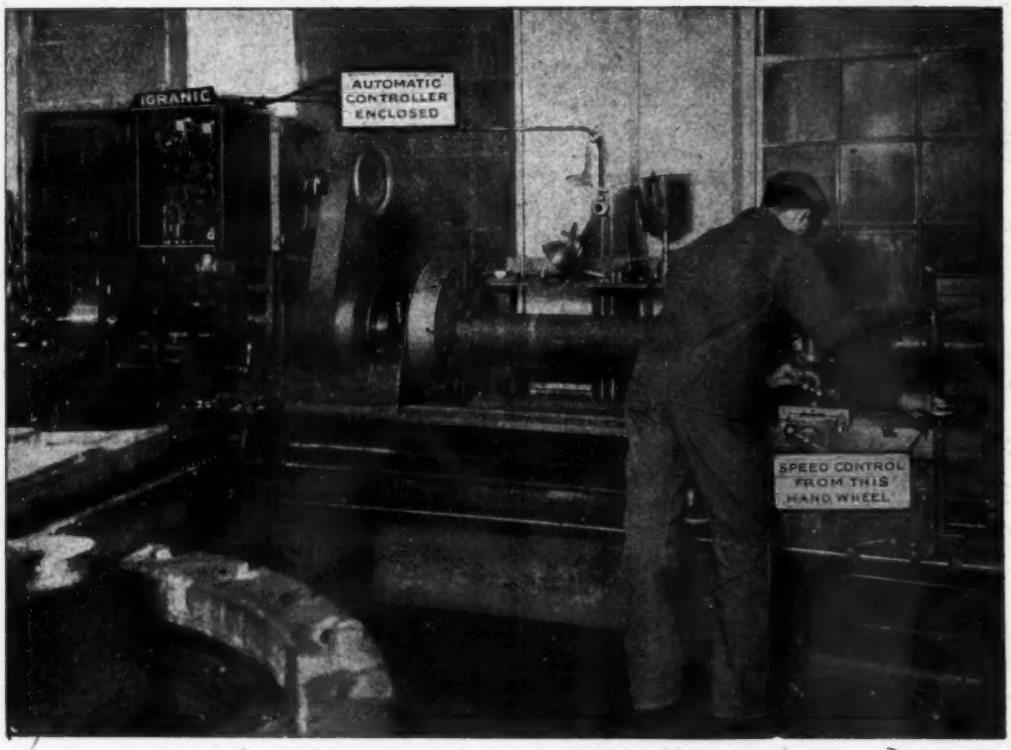

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